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AN/APS-137 FORWARD LOOKING AIRBORNE RADAR (FLAR) EVALUATION FALL 1992 EXPERIMENT

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This report is the ninth in a series that documents the Improvement of Search and Rescue Capabilities (ISARC) Project at the U.S.C.G. R&D Center.

16. Abstract

During April 1992 and September/October 1992, the U.S. Coast Guard R&D Center conducted experiments to determine the sweep width for the AN/APS-137 Forward Looking Airborne Radar (FLAR) when searching for 4-, 6- and 10-person life rafts and small recreational boats. Workboats used to deploy the life rafts during the Fall 1992 experiment were used as targets of opportunity.

The experiments were conducted in the coastal waters off the west coast of Florida from Wacussa Bay to Gasparilla Island and on Lake Erie. Realistic radar searches to collect data used unalerted sensor operators and standard search patterns for small waterborne targets. Aircraft and target positions were recorded using a Differential Global Positioning System (DGPS). Target detections were recorded by observers and by computers onboard the aircraft. Environmental conditions were recorded by observers on the workboats. In addition, MINIMET™ environmental buoys recorded the sea and wind conditions in the search areas. Environmental conditions represented in the data set included 1.0- to 3.6-foot significant sea heights and 2.9- to 15.2-knot winds.

Analysis of the data confirmed sweep width to be largely determined by lateral range, wind speed, and range scale for the life rafts. Lateral range, radar range scale, boat size, and wind speed determined the sweep width for small boats. Recommended sweep width values and AN/APS-137 FLAR search guidance are presented.

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METRIC CONVERSION FACTORS

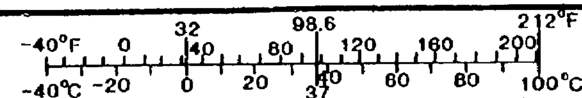
Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (WEIGHT)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (EXACT)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly).

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (WEIGHT)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	0.125	cups	c
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (EXACT)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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EXECUTIVE SUMMARY

INTRODUCTION

1. BACKGROUND

This report provides an analysis of the experiments that were conducted to evaluate the AN/APS-137 Forward Looking Airborne Radar (FLAR) for its effectiveness in the U.S. Coast Guard (USCG) maritime search and rescue mission. The objectives of the AN/APS-137 FLAR evaluation are to:

a. Establish the search and rescue capabilities of Coast Guard HC-130 aircraft equipped with the AN/APS-137 FLAR,

b. Compare the AN/APS-137 FLAR performance to that of the AN/APS-127 FLAR, and

c. Develop operationally realistic sweep widths and search guidance which search planners can use to conduct effective search and rescue missions under a variety of conditions.

The AN/APS-137 FLAR was evaluated onboard Coast Guard HC-130 fixed-wing aircraft from Coast Guard Air Station Clearwater, Florida. Two experiments have been conducted to support this evaluation. The first was conducted from 30 March to 10 April 1992 in the coastal waters off the west coast of Florida from Waccussa Bay to Gasparilla Island. The second was conducted from 21 September to 9 October 1992 in the waters of Lake Erie. This report discusses the detection performance of the AN/APS-137 FLAR against 4-, 6- and 10-person life rafts and against small boats.

The evaluation was conducted by the USCG Research and Development (R&D) Center as part of the Improvement of Search and Rescue Capabilities (ISARC) Project.

2. HC-130 AN/APS-137 FLAR SYSTEM DESCRIPTION

The HC-130 is a long-range surveillance aircraft used by the USCG for search and rescue, iceberg detection, law enforcement, fishery patrols, and marine environmental protection. The

AN/APS-137 FLAR was developed by Texas Instruments to detect small targets in a sea clutter environment. The AN/APS-137 FLAR is an X-band, air-to-surface Inverse Synthetic Aperture Radar (ISAR) that provides high resolution, small-target detection, weather avoidance, sea surveillance, and Doppler display. The FLAR system has special selectable features that enhance system performance against weak targets. These features are used to determine the search capability of the AN/APS-137 FLAR to detect life rafts and small boats. These features are:

- Periscope Search Mode -- This mode is designed for low altitude (3000 feet or lower), short range [32 nautical miles (nmi) or less], high resolution searches with an antenna scan speed of 300 revolutions per minute (rpm) and a pulse repetition frequency (PRF) of 2000 Hz. In this mode, sea clutter is significantly reduced, and the target returns are amplified to be more easily seen.

- Antenna Tilt Control -- Provides automatic or manual variation of radar antenna depression/elevation. Automatic tilt control sets the optimum depression/elevation angle based on aircraft altitude and range scale.

- Ground Stabilized Display Mode -- This mode enables sea clutter suppression and is the best mode for small-target detection. Stationary or slow-moving target returns remain at a constant position on the Plan Position Indicator (PPI) while the aircraft moves across the screen.

- Range Scale -- Larger range scales allow the target return to be on the screen longer. Smaller range scales allow for easier detection of short range, weak target returns. The 16- and 32-nmi range scales were the primary range scales used for this experiment. The 8-nmi range scale was used to a very limited extent to help evaluate the limits of the radar.

3. APPROACH

Data were collected using operational Coast Guard aircraft with crews trained in AN/APS-137 FLAR use. Standard search patterns were used to search for randomly-placed targets within the search area. The search crews were not alerted to target locations.

A Differential Global Positioning System (DGPS) was used to monitor target and search aircraft positions. These positions were recorded on a laptop computer and on data logs maintained by test team observers. Target detections made by the radar operator were logged by

the observer onboard the search unit for the first experiment and by an automated data logging system for the second experiment. Human factors were logged by an observer for both experiments. Environmental data were logged onboard chartered work boats. Environmental data buoys were deployed in the experiment area to record winds, sea conditions, and air and water temperatures.

Data reconstruction was performed to determine which target detection opportunities resulted in actual detections and at what lateral range each opportunity occurred. Raw data files were developed that included each target detection or missed opportunity along with the values of 13 search parameters of interest for each target opportunity. These data were analyzed on a desktop computer using a variety of statistical techniques including binary multivariate regression analysis. Lateral range versus target detection probability plots and sweep width estimates were developed for search conditions that were well represented in the data. The search parameters were analyzed for their significance at the 90-percent confidence level.

Human-factors data were compiled and analyzed quantitatively where possible. Subjective comments by search unit crews and data recorders were synopsized and incorporated into the Conclusions and Recommendations chapter of this report.

RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

1. RESULTS

A total of 401 life-raft and 584 small boat detection opportunities were generated during the Fall 92 experiment. These were combined with the 507 life-raft detection opportunities generated during the Spring 1992 experiment. Table 1 provides a summary of the distribution of the detection opportunities, by target type, for the combined Spring 92 and Fall 92 experiments. Environmental and search parameters represented in the data are listed in table 2.

Table 1. Summary of Distribution of Target Detection Opportunities by Target Type

Range Scale	4-person Life Raft	6-person Life Raft	10-person Life Raft	Small Boats 20 - 35 ft
16	59	317	309	332
32	9	124	90	252

Table 2. Environmental and Search Parameters

	Parameter	Unit of Measure	Measured Range of Values
Target	type	life raft	0
		small boat wood = 2, fiberglass = 3, metal = 4	2,3,4
	size	capacity for life rafts	4,6,10
		length overall (ft) for small boats	20 to 35
	lateral range	nautical miles	0 to 29.4
SRU	search speed	knots	180 to 220
	search altitude	feet	1000, 1500, 2000
	range scale	nautical miles	8, 16, 32
	relative bearing	degrees	-120 to 120
Environment	precipitation	none(0)/light(1)/moderate(2)/heavy(3)	0, 1
	significant wave height	feet	1.0 to 3.6
	whitecap coverage	none(0)/light(1)/moderate(2)/heavy(3)	0, 1, 2
	relative wave direction	into wave direction (+1) across wave direction (0) away from wave direction (-1)	-1, 0, 1
	wind speed	knots	1.0 to 15.2
Human Factor	time on task	hours	0 to 5.5

There was no significant difference in detection performance between the life-raft types or between the Spring 92 and Fall 92 data sets; therefore, the life rafts were all evaluated as one data set.

Lateral range plots and sweep width estimates were developed for the life rafts and small boats. Besides lateral range, other significant variables were identified as follows along with their associated data set groupings:

- Life Rafts
  - Range scale {16 and 32 nmi}, and
  - Wind speed {(1) 1 to 8 knots, and (2) 8.1 to 15.2 knots}.

- Small Boats
  - Range scale {16 and 32 nmi},
  - Size { (1) 20 to 25 feet, and (2) 26 to 35 feet}, and
  - Wind speed {(1) 1 to 8 knots, and (2) 8.1 to 15.2 knots}.

There were insufficient data to determine whether or not the hull composition of the small boats was a significant factor. The preliminary results indicate that it is not significant in determining the detection performance of the AN/APS-137 FLAR.

Although lower search altitudes were expected to improve detection performance in higher seas, search altitude was not identified as a significant variable. Lower search altitude was coincident with increasing significant wave height with the effect of one countering the other.

2. CONCLUSIONS -- LIFE RAFT DETECTION PERFORMANCE

- The significant variables for AN/APS-137 FLAR detection performance for life-raft targets are:
  - Radar range scale (the dominant variable),
  - Lateral range, and
  - Wind speed.

- The life-raft detection data for the AN/APS-137 FLAR show a notable decrease in radar detection performance for wind speed conditions from 8.1 to 15.2 knots.

- The 32-nmi range scale detection performance is significantly worse than the 16-nmi range scale. There were only 12 detections from 223 opportunities using the 32-nmi range scale. This low performance was most likely caused by the degradation in display resolution changing from the 16-nmi range scale to the 32-nmi range scale.

- The AN/APS-137 FLAR, overall, performed better than the AN/APS-127 FLAR for significant wave height conditions between 2.1 and 3.6 feet and comparable to the AN/APS-127 FLAR for significant wave heights less than or equal 2.0 feet.

- The AN/APS-127 FLAR on the 20-nmi range scale performed slightly better in the interval 14 to 16 nmi than the AN/APS-137 FLAR on the 16-nmi range scale in the

same range interval. This is likely due to the difference in on-screen time of the 14- to 16-nmi interval between the 16-nmi range scale and the 20-nmi range scale displays.

- Nearly all of the life raft detections were made within 30 to 45 degrees of the aircraft heading with a slight decrease in detection performance off the nose of the aircraft (000 deg relative). The time that the target stays on the screen appears to be the major factor in detection performance.

3. CONCLUSIONS - SMALL BOAT DETECTION PERFORMANCE

- The significant variables for AN/APS-137 FLAR detection performance for small boat targets are:
  - Lateral range (dominant variable),
  - Range scale,
  - Size, and
  - Wind speed.

- There is a notable increase in detection of small boats greater than 25 feet. This may be due to the likelihood of boats larger than 25 feet having a deckhouse or superstructure which provides a larger radar cross-section than most boats smaller than 25 feet.

- The AN/APS-137 FLAR is able to detect small boats beyond 16 nmi for all environmental conditions encountered during the experiment. There does not appear to be a substantial degradation in detection performance at ranges within 16 nmi when using the 32-nmi range scale.

- The AN/APS-137 FLAR detection performance against 23- to 30-foot small boats is markedly improved over that of the AN/APS-127 FLAR for the 16-nmi range scale in higher sea conditions (2.1 to 3.6 feet). The performance of the AN/APS-137 FLAR is comparable or only marginally better than that of the AN/APS-127 FLAR for all other tested conditions.

- Radar operators have some difficulty distinguishing a weak contact from a persistent sea return.

- Small boat detections were made primarily in front of the aircraft. The data set is small, however, and the performance versus relative bearing analysis cannot draw any definite conclusions.

4. RECOMMENDATIONS FOR AN/APS-137 FLAR SEARCHES FOR LIFE RAFTS

- The sweep widths in table 3 should be used to represent the detection performance of the AN/APS-137 FLAR against 4-, 6- and 10-person life-raft targets.

- The 16-nmi range scale in periscope mode should be the primary range scale and mode used when searching for life rafts. The 32-nmi range scale should never be used for life-raft searches. The 32-nmi range scale degrades detection performance for life rafts at all lateral ranges, possibly due to degradation in the screen resolution. There were life-raft targets detected beyond 8 nmi, even for the higher wind speed and higher significant sea height conditions. For this reason, the 8-nmi range scale should be used only briefly to investigate a target.

- The radar operator should turn the heading cursor off when searching for life-raft targets.

Table 3. Sweep Widths for 4-, 6- and 10-Person Life Rafts Using the AN/APS-137 FLAR

Range Scale (nmi)	Wind Speed (knots	Sweep Width (nmi)
16	1.0 to 8.0	8.8
	8.1 to 15.2	3.8

5. RECOMMENDATIONS FOR AN/APS-137 FLAR SEARCHES FOR SMALL BOATS

- The sweep widths provided in table 4 should be used for all AN/APS-137 FLAR searches for small boats from 20 to 35 feet in overall length.

- The total detection performance, as reflected in the sweep width values, on the 32-nmi range scale was comparable to that on the 16-nmi range scale. The choice of range scales for small boat searches can be left to the operator. However, we recommend the use of the 32-nmi range scale which has the advantage of greater target integration time.

6. GENERAL RECOMMENDATIONS FOR AN/APS-137 FLAR SEARCHES

- The AN/APS-137 FLAR operator should reposition the sweep origin to maximize the on-screen time for weak or close aboard contacts. Based on the results, the operator should not allow more than one-quarter of any part of the radar range scale display to go off the screen.

- Radar operators should not concentrate all of their efforts to within one track spacing but should always search to the end of the range scale.

Table 4. Sweep Widths for Small Boats (20 to 35 feet) Using the AN/APS-137 FLAR

Range Scale (nmi)	Size (ft)	Wind Speed (knots)	Sweep Width (nmi)
16	20 – 25	≤ 8.0	17.7
		8.1 to 15.2	8.4
	25 to 35	≤ 8.0	20.9
		8.1 to 15.2	17.2
32	20 – 25	≤ 8.0	15.4
		8.1 to 15.2	N/A
	25 to 35	≤ 8.0	25.6
		8.1 to 15.2	17.8

- When conducting searches for weak or small targets, the operator should turn the heading cursor off. Since a large portion of the detections are made in front of the aircraft, leaving the cursor on may actually hide close aboard, weak contacts.

- For long searches, rotate the operator after the first hour and then every one to two hours afterward.

- Develop operator training exercises which use real identifiable targets in the raft and small boat categories to provide positive operator "feedback".

- Equip Coast Guard search radars with weak target location and discrimination capabilities that assist the operator and which do not interrupt the search process.

7. RECOMMENDATIONS FOR FUTURE RESEARCH

- Future experiments should include data to determine the effects of altitude on detection performance under various environmental conditions.

- Both low and high significant wave height (H_S) data are needed to fully investigate the effects of H_S on detection performance.

- The data collected for the AN/APS-137 FLAR does not contain sailboat data. Future experiments should include sailboats as targets.

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The authors would like to thank the many individuals from the numerous Coast Guard units that participated in the fall 1992 evaluation of the AN/APS-137 radar. During the course of this field experiment, many Coast Guard units in the Coast Guard District Nine (CGD9) assisted with travel arrangements, logistics, communications, equipment, and navigation. The personnel of CGD9 Boating and Safety Division coordinated the CG Auxiliary Eastern and Western Region units to obtain the participation of 80 Auxiliarists and more than twenty Auxiliary vessels. These vessels were the primary targets used during the experiment. CG Group Buffalo and CG Group Detroit provided essential support in issuing and processing travel orders for the participating Auxiliarists and also in providing communication services throughout the experiment period for all participating units. CG Stations Erie, Cleveland, Astabula, Fairport provided mooring, communications, and shore support for Auxiliary units operating in their areas. CG Station Cleveland also furnished facilities and communications for the Research and Development Center field team to operate a control center. CG Station Fairport was most helpful in providing assembly and storage spaces for the environmental buoy which was deployed in the operating area.

The authors would also like to thank the air crews from CG Air Station Clearwater who operated the search aircraft (CG-1720) out of Cleveland during the experiment for their diligence and long hours. The support personnel in Electronics at the Air Station were instrumental in preparing the aircraft and radar for the experiment.

Particular thanks is extended to the men and women of the United States Coast Guard Auxiliary and the Canadian Coast Guard Auxiliary who provided and crewed the many vessels which served as search and rescue targets for the search aircraft during the experiment. These individuals spent long hours of their own time under sometimes unpleasant conditions to provide the types of targets upon which the entire experiment depended.

We also extend our appreciation for the services provided by Mr. A. Allen, DC1 E. Huelsenbeck, and Mr. C. Oates in the preparation, deployment, and recovery of the environmental buoy; Mr. G. Reas for his expertise developing an on board positioning package and in servicing and maintaining the electrical and communications equipment; Mr. S. Ricard, Mr. R. Marsee, Mr. J. Plourde, and Mr. T. Noble who provided target support, Auxiliary liaison, and logistics support; Mr. D. Brennen for his assistance with the collection and processing

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CHAPTER 1
INTRODUCTION

1.1 SCOPE AND OBJECTIVES

This report is the third in a series that documents the U.S. Coast Guard (USCG) Research and Development (R&D) Center evaluation of the AN/APS-137 Forward Looking Airborne Radar (FLAR) capabilities for search and rescue missions. During the Spring 1991, a preliminary evaluation was conducted off the coast of Newfoundland, Canada, to help establish the experiment parameters to be used during future experiments. Two experiments, described in section 1.3, have been conducted to support this evaluation. Coast Guard HC-130 long-range surveillance aircraft were equipped with the AN/APS-137 FLAR during searches for small to medium size boats and 4-, 6- and 10-person life rafts.

This evaluation of the AN/APS-137 FLAR is part of the R&D Center's Improvement of Search and Rescue Capabilities (ISARC) Project. Project objectives are to improve search planning and execution and to evaluate visual and electronic search methods, leeway drift, ocean current drift, and visual distress signals. Specific objectives of the AN/APS-137 FLAR evaluations are to:

1. Establish the search and rescue capabilities of Coast Guard HC-130 aircraft equipped with the AN/APS-137 FLAR,

2. Compare the AN/APS-137 FLAR performance to that of the AN/APS-127 FLAR, and

3. Develop operationally realistic sweep widths and search guidance which search planners can use to conduct effective search and rescue missions under a variety of conditions.

1.2 HC-130 AN/APS-137 FLAR SYSTEM DESCRIPTION

The HC-130 is a long-range surveillance aircraft used by the USCG for search and rescue, iceberg detection, law enforcement, fishery patrols, and marine environmental protection. The AN/APS-137 FLAR is an X-band air-to-surface Inverse Synthetic Aperture Radar (ISAR) developed to provide high resolution, small target detection, weather avoidance, sea surveillance,

and Doppler display. The AN/APS-137 FLAR was developed by Texas Instruments to detect small targets in a sea clutter environment. Detailed information and principals of operation can be found in references 1 and 2. This experiment used the following features to determine the search capability of the AN/APS-137 FLAR for life rafts and small boats.

- Periscope Search Mode -- This mode is designed for low-altitude (3000 feet or lower), short-range [32 nautical miles (nmi) or less], high-resolution searches with an antenna scan speed of 300 revolutions per minute (rpm) and a pulse repetition frequency (PRF) of 2000 Hz. In this mode, sea clutter is significantly reduced, and the target returns are amplified to be more easily seen.

- Antenna Tilt Control -- Provides automatic or manual variation of radar antenna depression/elevation. Automatic tilt control sets the optimum depression/elevation angle based on aircraft altitude and range scale.

- Ground Stabilized Display Mode -- This mode allows sea clutter suppression and is the best mode for small-target detection. Stationary or slow-moving target returns remain at a constant position on the Plan Position Indicator (PPI) while the aircraft moves across the screen.

- Range Scale -- Larger range scales allow the target return to be on the screen longer. Smaller range scales allow for easier detection of short range, weak target returns. The 16- and 32-nmi range scales were the primary range scales used for this experiment. The 8-nmi range scale was used to a very limited extent to help evaluate the limits of the radar.

1.3 EXPERIMENT DESCRIPTION

The first of two experiments that were conducted to support this evaluation was conducted in the coastal waters off the west coast of Florida from Waccussa Bay to Gasparilla Island from 30 March to 10 April 1992. The second was conducted from 21 September to 9 October 1992 in the waters of Lake Erie. The following sections describe these experiments.

1.3.1 Participants

The USCG R&D Center, Avery Point, Groton, Connecticut, conducted and controlled the AN/APS-137 FLAR evaluation during the Spring 1992 and Fall 1992 experiments. A full team of USCG R&D Center personnel and personnel from Analysis & Technology, Inc. (A&T), the prime contractor, were responsible for the overall conduct of the experiment, that included the following:

- Equipment installation, operation, and maintenance,
  - MINIMET™ meteorological buoy
  - Differential Global Positioning System (DGPS) tracking systems
- Workboat coordination,
- Aircraft coordination,
- Communications and Control,
- Data collection, and
- Logistics.

1.3.1.1 Florida Experiment, Spring 1992

During the Spring 1992 experiment, the USCG Air Station Clearwater provided an HC-130 aircraft equipped with the AN/APS-137 FLAR, the flight crews, and all of the necessary technical and administrative support personnel. Air Station Clearwater also provided a mobile communications trailer that functioned as R&D Control. All experiment-related communications were relayed to R&D Control by the Coast Guard Group St. Petersburg.

The Group St. Petersburg Aids-to-Navigation Team and Electronics Shop supported the DGPS installation at the radio beacon tower at Egmont Key. The Group Communications Division also provided communications support for all experiment participants.

Three separate commercial companies subcontracted workboat services to deploy the life rafts. Each workboat included a qualified Captain and a crew member. A field team coordinator was also on board each workboat to record target positions and to assist in target deployment and recovery. The LCM "Seahorse" out of Venice, FL, and the Townsend, Inc. tug out of Yankeetown, FL, deployed the MINIMET™ environmental buoys.

Table 1-1 lists the aircraft and boat resources used during this experiment.

Table 1-1. Spring 1992 Aircraft and Boats

Type	Location	Name/Designation
AIRCRAFT	USCG Air Station Clearwater	CG-1716 CG-1416 CG-1720
BOATS	Crystal River, Florida	Wantabe Doghouse
	St. Petersburg, Florida	Terri Lynn Jumpin'Jack Flash
	Venice, Florida	Blue Seas III Black Jack III

1.3.1.2 Lake Erie Experiment, Fall 1992

During the Fall 1992 experiment, the USCG Air Station Clearwater, FL provided the HC-130 aircraft equipped with the AN/APS-137 FLAR. The aircraft staged out of Burke Airport, Cleveland, OH, for the duration of the experiment. USCG Station Cleveland Harbor, OH, provided facilities to support R&D Control. USCG Station Fairport Harbor, OH, provided facilities for set-up and tear-down of the meteorological buoy. USCG Station Fairport Harbor and the Ninth District Electronics Shop supported the DGPS installation at the Fairport Harbor Light House.

Two workboats were hired to deploy life-raft targets. An R&D Center coordinator on board each workboat recorded target positions and assisted in target deployment and retrieval. Thirty-two CG Auxiliarists and Canadian CG Auxiliarists volunteered their time and their personal boats to serve as targets. Each CG Auxiliary boat had at least one auxiliarists crew member. Several of these boats were also asked to deploy and retrieve life rafts. The Salvage Chief deployed and retrieved the MINIMET™ environmental buoy.

Table 1-2 lists the aircraft and boat resources used during this experiment.

Table 1-2. Fall 1992 Aircraft and Boats

TYPE	DEPLOYMENT LOCATION	NAME/DESIGNATION	
AIRCRAFT	USCG Air Station Clearwater	CG-1720	
BOATS	Cleveland, Ohio	Rum Runner High Hopes Morning D. Kelly Lynn My Sanity	Angie J-Sea Phanta-C Boots Sea Wolf
	Fairport, Ohio	Illini	Val Jimmi
	Ashtabula, Ohio	Carols Pride Dragonfly Catherine L.	Shepard 1-2 Crew Gu-Bee
	Erie, Pennsylvania	Eights-Enuf Queen Ellie II Good Time Charlie	The Lady J. Ebb Tide
	Port Stanley, Ontario	Blue Fin CG 1080	Run About
	Leamington, Ontario	Seanile Ann Teak Stocks & Blondes Dorothy Sea	Stardust Boomerang Plug Nickle II Loop Hole

1.3.2 Exercise Area

1.3.2.1 Spring 1992 Exercise Area

The search area covered 4800 square miles and consisted of a northern and southern area separated by the Tampa Bay Safety Fairway. Figure 1-1 depicts the orientation of the search area. The northern area was a 40- x 80-nmi area centered at 28°25.0'N, 83°23.0'W along a major axis of 000°T. The southern area was a 40- x 40-nmi area centered at 26°55.0'N, 83°03.0'W along a major axis of 155°T. Each area was further divided into workboat sectors, and each of the six workboats was assigned a sector for distributing the targets. Life-raft targets were deployed throughout each sector according to random settings to ensure a near-uniform target density throughout the search area.

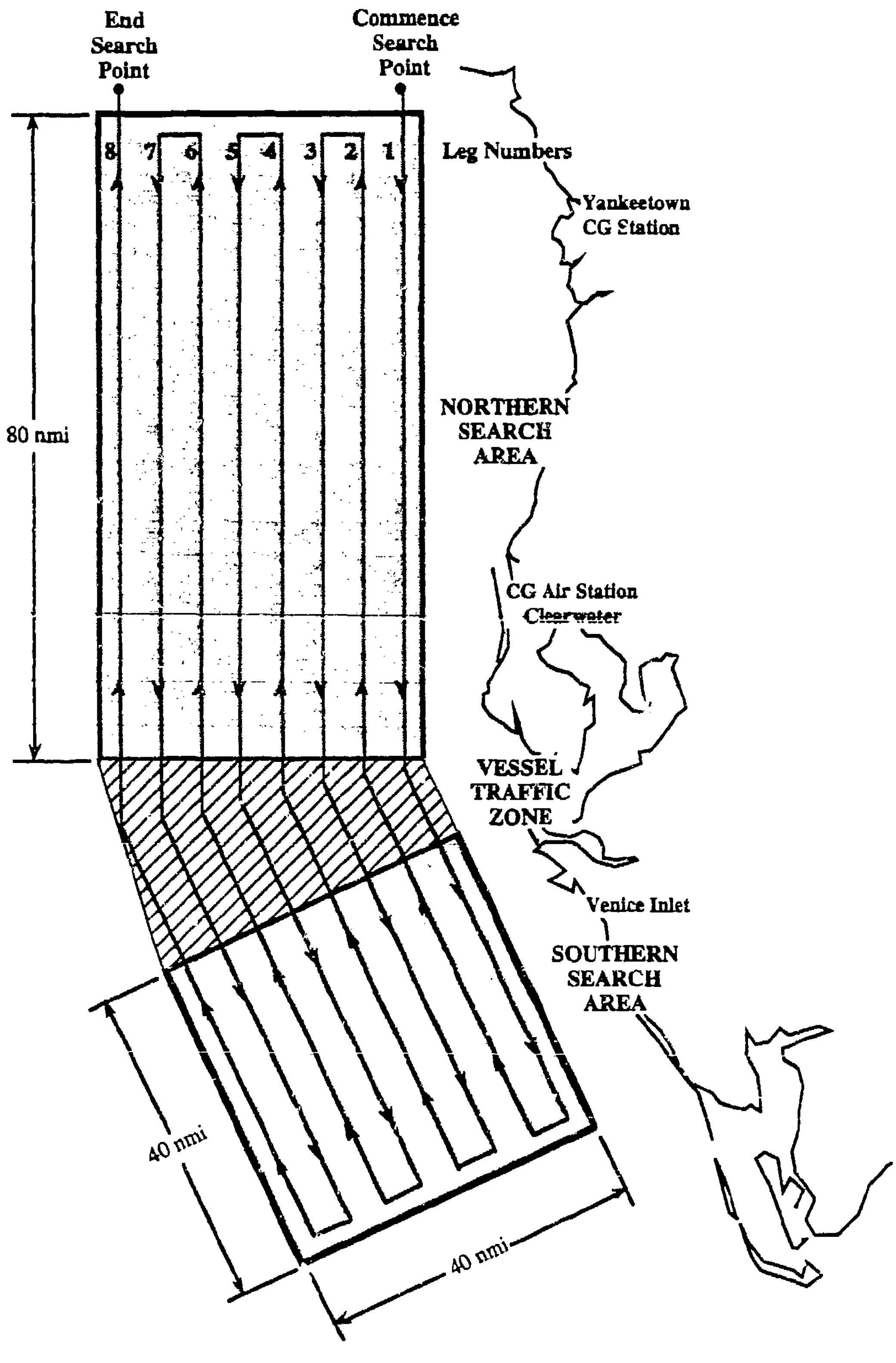

Figure 1-1. Spring 1992 Search Area and Aircraft Search Plan

An operations center (R&D Control) was established at Air Station Clearwater. R&D Control was responsible for search and rescue unit (SRU) and workboat coordination and supervision. When delays in the commencement of the search were encountered, R&D Control moved the western edge of the search area east by 10 nmi for every hour of delay. After a 4-hour delay, the exercise was canceled for the day.

1.3.2.2 Fall 1992 Exercise Area

The search area for the Fall 1992 experiment covered 3200 square miles and consisted of the main body of Lake Erie. Figure 1-2 depicts the search area for the Lake Erie experiment. The search area was 100 nmi long and 38 nmi wide. The width of the eastern section of the area was shortened to avoid conducting searches over land. The search area was divided into six sectors corresponding to the six CG Auxiliary deployment locations. These sectors were used to optimize the deployment of the auxiliary vessels and to minimize interference between boats and life rafts. Life rafts were deployed throughout the exercise area in a random distribution to ensure a near-uniform target density throughout the search area. The CG Auxiliary boats and workboats operated out of their respective ports as indicated in table 1-3.

An operations center (R&D Control) was established at CG Station Cleveland Harbor. R&D Control was responsible for SRU and workboat coordination and supervision. When delays in the commencement of the search were encountered, R&D Control canceled one of the racetrack searches for each hour of delay. After a 2-hour delay, the exercise was canceled for the day.

1.3.3 Targets

There were three types of life rafts used during these experiments. There were 4-, 6- and 10-person life rafts and all were equipped with canopies. The six workboats used to deploy the life rafts in the Spring 1992 experiment loitered inside the search area during the search and were evaluated as medium-sized targets of opportunity. During the Fall 1992 experiment, assigned auxiliary boats and two workboats deployed life rafts and then proceeded to designated positions as targets for the duration of the search. All small boat targets were directed to make no wake during the times the aircraft was searching. Table 1-3 lists the targets and their descriptions.

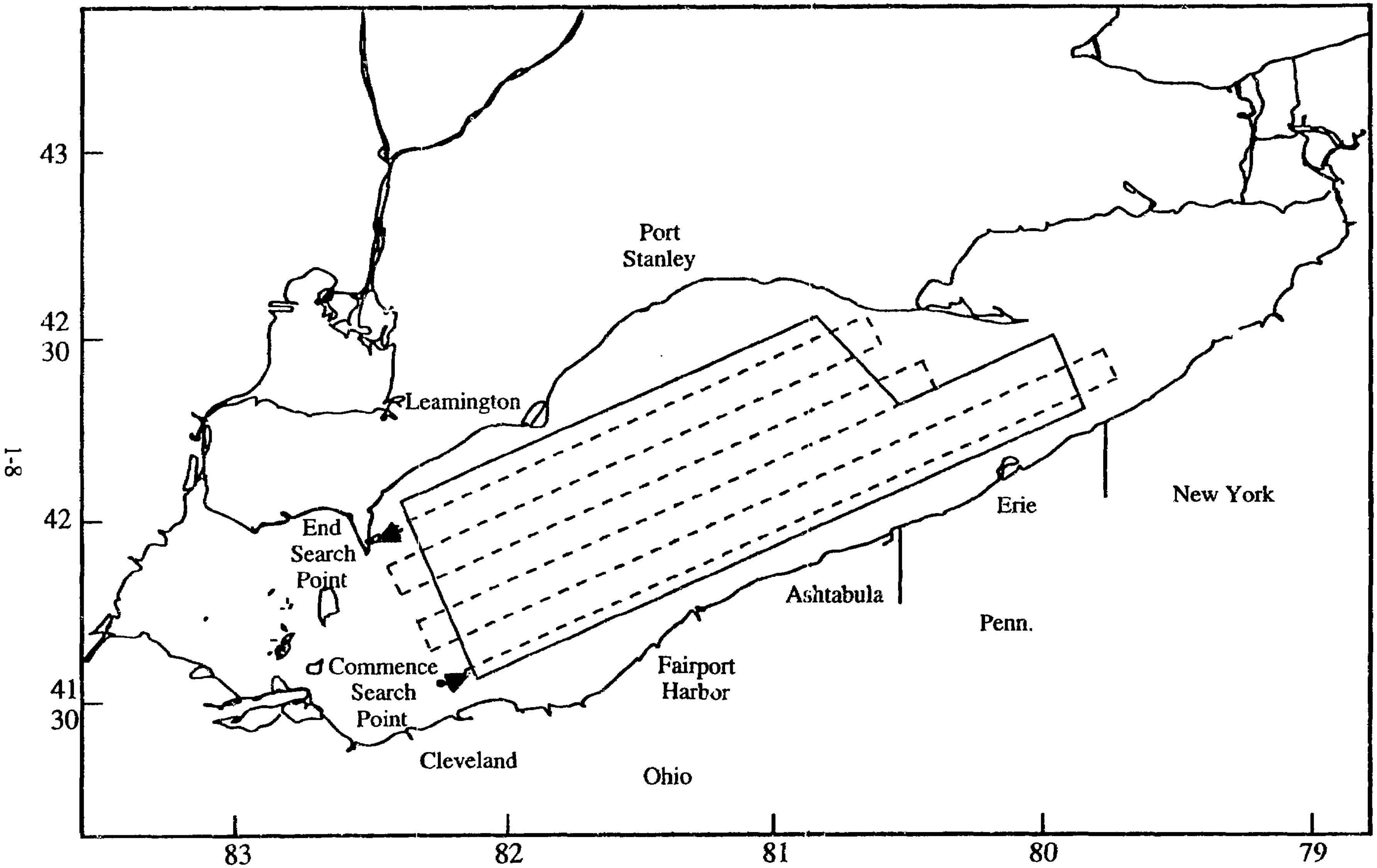

Figure 1-2. Fall 1992 Aircraft Search Plan - Parellel Search

Table 1-3. Targets Used During AN/APS-137 FLAR Field Experiments

Target Type	Designation	Size (feet)*	Principal Material	Experiment / Location
Boats				
Cuddy Cabin	Rum Runner	23	Fiberglass	Cleveland, OH
	Phanta-C	24	Fiberglass	Cleveland, OH
	Sea Wolf	26	Fiberglass	Cleveland, OH
	Morning D.	22	Fiberglass	Cleveland, OH
	Kelly Lynn	21	Fiberglass	Cleveland, OH
	My Sanity	28	Fiberglass	Cleveland, OH
	Angie	22	Fiberglass	Cleveland, OH
	Dragonfly	22	Fiberglass	Ashtabula, OH
	Shepard	23	Fiberglass	Ashtabula, OH
	Queen Ellie II	23	Fiberglass	Erie, PA
	The Lady J.	18	Fiberglass	Erie, PA
	Stardust	23	Fiberglass	Leamington, Ont
With Deck House	Boots	26	Wood	Cleveland, OH
	Illini	35	Wood	Fairport, OH
	Catherine L.	35	Wood	Ashtabula, OH
	1-2 Crew	35	Fiberglass	Ashtabula, OH
	GU-Bee	35	Fiberglass	Ashtabula, OH
	Good Time Charlie	30	Fiberglass	Erie, PA
	Blue Fin	30	Fiberglass	Port Stanley, Ont
	CG 1080	25	Fiberglass	Port Stanley, Ont
	Run About	30	Metal	Port Stanley, Ont
	Ann Teak	31	Wood	Leamington, Ont
	Stocks & Blondes	32	Metal	Leamington, Ont
	Loop Hole	30	Fiberglass	Leamington, Ont
With Flying Bridge	High Hopes	34	Fiberglass	Cleveland, OH
	Val Jimmi	32	Fiberglass	Fairport, OH
	Carols Pride	28	Fiberglass	Ashtabula, OH
	Eights-Enuf	32	Metal	Erie, PA
	Ebb Tide	26	Fiberglass	Erie, PA
	Seanile	34	Fiberglass	Leamington, Ont
	Boomerang	35	Fiberglass	Leamington, Ont
Center Console	J-Sea	24	Fiberglass	Cleveland, OH
	Dorothy Sea	22	Metal	Leamington, Ont
	Plug Nickle II	22	Fiberglass	Leamington, Ont
Life Rafts				
4-Person	Avon w/Canopy	6.0 dia x 3.5	Rubber/Fabric	Clearwater, FL
	Viking w/ Canopy	5.5 sq. x 3.5		
6-Person	Switlik w/ Canopy	8.6 x 5.8 oval x 3.8	Rubber/Fabric	Clearwater, FL and Lake Erie
10-Person	Switlik w/ Canopy	7.8 x 10.8 oval x 4.2	Rubber/Fabric	Clearwater, FL and Lake Erie
	BF Goodrich w/ Canopy	9.2 dia x 5.2	Rubber/Fabric	

* Small boat size is the length of the boat. Life raft size is the outside dimension x height.

1.3.4 Experiment Design and Conduct

These experiments were designed to characterize the detection performance of the AN/APS-137 FLAR against small targets in various environmental conditions and to establish a data base to be built upon in future experiments. Detection data were obtained using unalerted operators and a parallel search pattern or a racetrack search pattern. Track spacing for the parallel searches was set at 5 nmi for the Spring 1992 experiment and at 5.5 nmi for the Fall 1992 experiment. This distance was based on initial detection range estimates conducted during the Spring 1991 (reference 3) and Spring 1992 (reference 4) experiments. Figures 1-1 through 1-3 illustrate the search plans for the HC-130 for each of the experiments. The targets were placed at uniform-distributed random positions throughout the workboat sector at an average target-to-target distance of approximately 8 nmi. The minimum target-to-target distance was 5 nmi. During the Spring 1992 experiment, it was discovered that it took the slower workboats almost 6 hours to deploy/recover the life rafts. This time was shortened by minimizing the north-south (N-S) randomness of the target positions but not enough to invalidate the assumption of uniform target distribution. The target positions for the Fall 1992 experiment did not require modifications.

The HC-130 typically searched at 1500 feet altitude and at speeds from 180 knots to 220 knots. The planned speed of 240 knots was too fast and was changed early during the Spring 1992 experiment to 220 knots. The first search during the Spring 1992 experiment also concentrated on reporting all contacts. In areas of high-contact density, recording the contacts by hand made it difficult to accurately record the time (to the nearest second), range, and bearing before the next contact was called. To reduce the workload on the data recorder during the Spring 1992 experiment, subsequent searches used a priori knowledge of what life-raft and small boat detections looked like to discriminate obviously large targets (tankers/merchants) from small ones (life rafts/small boats).

The HC-130 crew consisted of personnel from the normal complement at Air Station Clearwater. All radar operators were experienced in the use of the AN/APS-137 FLAR, and this experience level was representative of the current AN/APS-137 FLAR experience in the Coast Guard. During the experiment, the crews were encouraged to treat the search as an actual search and rescue mission with the exception that lookouts would not alert the radar operator to any visual contacts. Also, the SRU would not deviate from the search track, and the radar operator would not switch to IMAGE mode in order to verify a target.

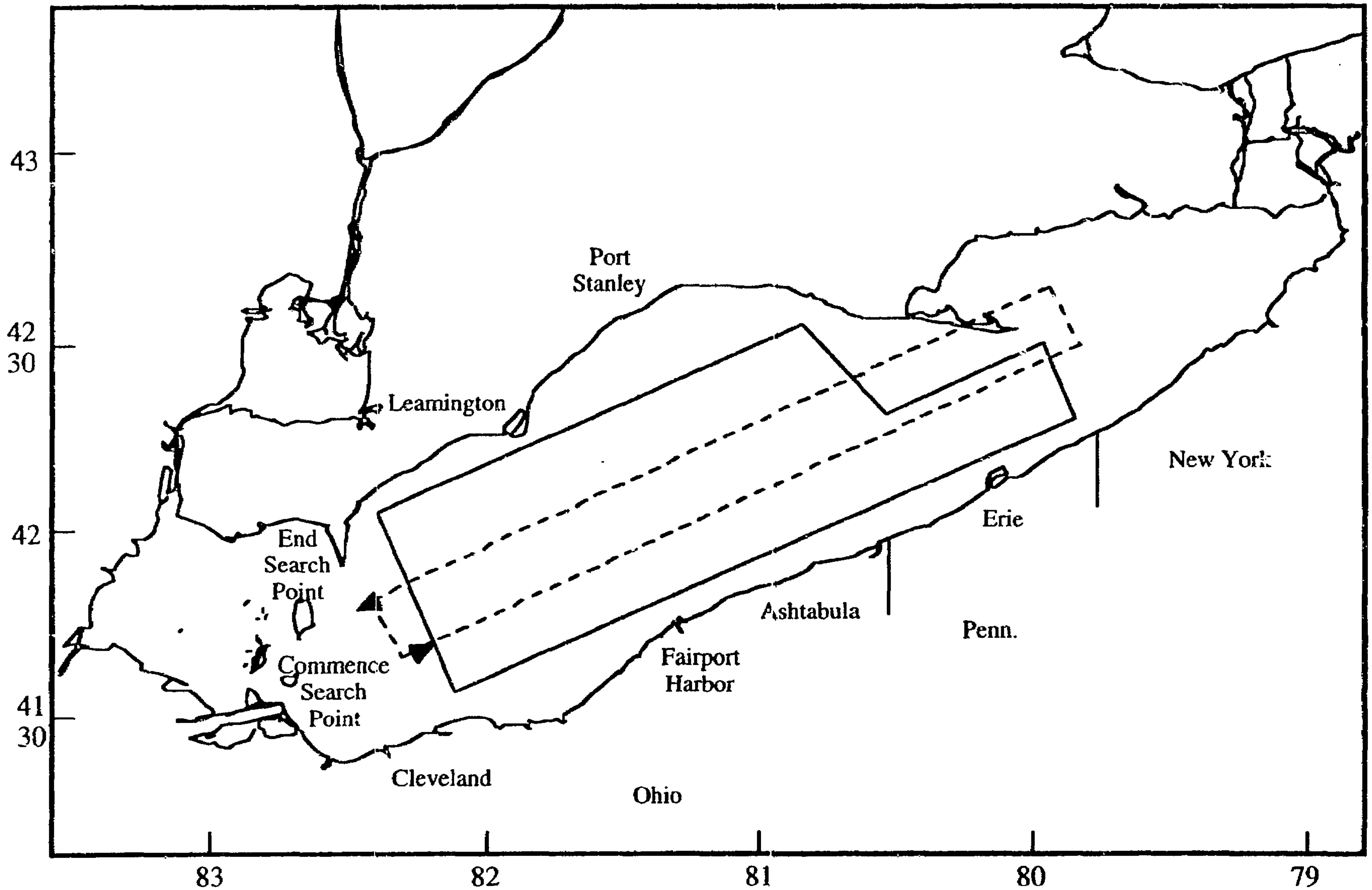

Figure 1-3. Fall 1992 Aircraft Search Plan - Racetrack Search

On the morning of each search day, the workboats departed from their respective ports and deployed all of the targets before the targets would be within the aircraft's radar range. A data recorder accompanied each workboat to assist in target deployment and recovery and to record navigational and environmental data. A data recorder accompanied each HC-130 flight to record target detections, human factors, crew comments, and any other relevant information.

During the aircraft pre-flight briefs, it was stressed that the radar operators search out to the limits of the range scale and not be limited by the search track spacing. This procedure would optimize the detection performance and minimize the number of missed detection opportunities. The radar operators were also briefed to mark every contact, regardless of size, to ensure that both life raft and small boat detections were recorded. Only obviously large targets, such as large merchants or tankers, were not recorded during the Spring 1992 experiment.

For the Spring 1992 experiment, when a target was detected, the radar operator reported the target's range and true bearing, and the data recorder recorded the information and the time of detection to the nearest second. For this experiment, some of the data were also automatically recorded by the Airborne Data Acquisition Management (ADAM) system, a temporarily-installed system onboard the HC-130. ADAM recorded time, true bearing, range, and the aircraft Inertial Navigation System (INS) position for each target tag.

For the Fall 1992 experiment, the radar was modified to automatically send target range and bearing, as well as aircraft and target INS positions, to a personal computer. The computer collected, converted to text, and recorded to a floppy disk the data for analysis at the end of the experiment. This method of data recording minimized the errors associated with manual recording and also allowed for later use of an automated data reconstruction system. The onboard observer was free to monitor the operator's actions and comment on conditions during the search.

During the Spring 1992 searches, video recordings were made of the radar PPI display. These tapes were used in reconstruction to help resolve life-raft or workboat detections when a question arose from the hand-reconstructed SRU-target positions. No video recordings could be made of the Fall 1992 searches.

On-scene environmental conditions were recorded manually by the experiment observers on the workboats and automatically by the MINIMET™ meteorological buoys placed in the search areas. The observers onboard each workboat recorded environmental data on the Environmental Conditions Summary Form (figure 1-4) using the equipment installed on each workboat.

ENVIRONMENTAL CONDITIONS SUMMARY

SECTOR NUMBER ____________ DATE ____________

TIME	SURFACE WIND		CLOUD COVER (tenths)	CLOUD CEILING (ft)	VISIBILITY (nml)	WEATHER DESCRIPTION (clear, rain, fog, etc.)	SEA STATE			RELATIVE HUMIDITY (%)	AIR TEMP. (C)	WATER TEMP. (C)
	TRUE SPEED (knots)	TRUE DIRECTION (deg T)					H_S* (ft)	WHITE CAPS (N/S/M)	SWELL DIR (deg T)			
**METHOD OF MEASUREMENT												

*Significant wave height.

**Note: Method may be scientific (anemometer, radar, psychrometer, etc.) or an estimate. Indicate method used to measure each parameter.

OBSERVER: ____________

Figure 1-4. Sample Environmental Conditions Summary Form

Two MINIMET™ buoys were deployed during the Spring 1992 experiment, one at the midpoint of the northern area and one at the midpoint of the southern area (figure 1-1). One MINIMET™ buoy was used during the Fall 1992 experiment. This buoy was positioned only 7 [illegible] the southern shore of Lake Erie due to adverse weather conditions and mechanical problems with the boat deploying the buoy. These environmental buoys were the preferred method of measuring environmental conditions. Each buoy transmitted data, by means of a satellite uplink, to the International Ice Patrol. R&D Control received these data via land line, and used them as a factor in deciding if sea conditions were safe enough to deploy the targets[1]. The MINIMET™ information was also stored on magnetic storage media onboard the buoy as a backup to the transmitted data. Figure 1-5 is an example of the data messages received from the buoy.

1.3.5 Tracking and Reconstruction

The primary method of obtaining position data was DGPS (.005 nmi accuracy). The aircraft, each of the workboats, and each of the Auxiliarists (Fall 1992 experiment) carried a DGPS receiver unit on board. LORAN-C was used as a backup means of keeping position for each of the boats. The differential transmitters were located at Egmont Key, FL, and Fairport Harbor, OH. Prior to each search, the secondary navigation systems on board the vessels and the aircraft were initialized to the DGPS position, establishing a tie point for each of the units. When DGPS was unavailable, these tie points were used to reconstruct the position of the vessel or aircraft.

Each of the workboats deployed four to five life rafts that were anchored in 100 to 200 feet of water with 8- or 12- pound Danforth anchors. Upon deployment and retrieval of the life rafts, the DGPS position of the life raft and the time were recorded. If the positions differed from deployment to retrieval, the life raft position at the time of possible detection was a linear interpolation of the two positions.

[1] The criteria for canceling the day's search was 20-knot winds and 4-foot seas; although the workboat captains made the final decision on whether or not they would deploy.

```
Z901MET 890927 21 10 045 129 045 045 086 059 178 121 153 259800 439209 00
Buoy #901 - Met. Data - 27 Sep 1989 / 21:10:00
      Vector Wind Speed: 4.5 mps (8.75 knots)
      Vector Wind Direction: 129°M
      Average Wind Speed: 4.5 mps (8.75 knots)
      Average Azimuth Reading: 45°M
      Average Vane Reading: 86°M
      wind Gust: 5.9 mps (11.47 knots)
      Water Temperature: 17.8°C (64°F)
      Air Temperature: 12.1°C (53.8°F)
      Battery Voltage: 15.3 volts
      Loran Time Delays: 25980 / 43920.9  S/N: 0  C/S: 0
      Latitude/Longitude: 41°12.171'N / 71°47.905'W

1 Z901WAV 890927 21 087 110 104 095 112 113 126 175 174 206 204 239 246
2 Z901WAV 890927 21 239 223 204 206 198 189 193 196 168 189 171 187 205
3 Z901WAV 890927 21 224 241 255 251 245 250 001 004 009
Buoy #901 - Wave Data
      Record #1 - Wave Spectral Values 1 to 13 - 27 Sep 1989 / 21:30:00
        087 110 104 095 112 113 126 175 174 206 204 239 246
      Record #2 - Wave Spectral Values 14 to 26 - 27 Sep 1989 / 21:30:00
        239 223 204 206 198 189 193 196 168 189 171 187 205
      Record #3 - Wave Spectral Values 27 to 32 - 27 Sep 1989 / 21:30:00
        224 241 255 251 245 250
      Scaling Factor: 1
      Significant Wave Height: .4 m (1.3 ft)
      Maximum Wave Period: .9 sec

Z901MET 890927 21 40 051 115 051 045 072 062 178 118 158 259800 43209 00
Buoy #901 - Met. Data - 27 Sep 1989 / 21:40:00
      Vector Wind Speed: 5.1 mps (9.91 knots)
      Vector Wind Direction: 115°M
      Average Wind Speed: 5.1 mps (9.91 knots)
      Average Azimuth Reading: 45°M
      Average Vane Reading: 72°M
      wind Gust: 6.2 mps (12.05 knots)
      Water Temperature: 17.8°C (64°F)
      Air Temperature: 11.8°C (53.2°F)
      Battery Voltage: 15.8 volts
      Loran Time Delays: 25980 / 43920.9  S/N: 0  C/S: 0
      Latitude/Longitude: 41°12.171'N / 71°47.905'W
```

Figure 1-5. Example MINIMET™ Data Message

The HC-130 search track and the workboat and target locations were plotted using the recorded position data. A hard copy text printout of the actual positions and times along the search track along with the plot was available to help in reconstruction of lateral range information. Figure 1-6 is an example of a reconstructed search plot. Each target is shown by its two-letter designator and the HC-130 search track is shown as a star (*) or a plus (+).

A target was considered a detection opportunity if its lateral range [measured as the closest point of approach (CPA) to the aircraft search track] was within the range scale used for that search. Analysis of the Spring 1992 data concluded that small radar cross-section targets (i.e., life rafts) were rarely detected beyond 13 nmi. It was expected that the workboats would be detectable to the edge of the 16 nmi range. To account for the longer small boat detection ranges, the 32 nmi range scale was selected in conjunction with the racetrack search pattern (Fall 1992 experiment) to establish the limits of small boat detection performance for the radar.

The radar contacts were correlated to actual target positions by comparing target bearing and range from the DGPS HC-130 position to the actual DGPS target positions. A detection was recorded if the positions matched within a specified tolerance (typically 0.5 nmi). A target which was an opportunity but not detected was recorded as a miss. Multiple detections on the same search leg were not counted.

1.3.6 Search Parameters

A total of 13 search parameters were recorded for each target detection opportunity. The parameters were categorized as target, SRU, environment, or human factors related and are described in table 1-4.

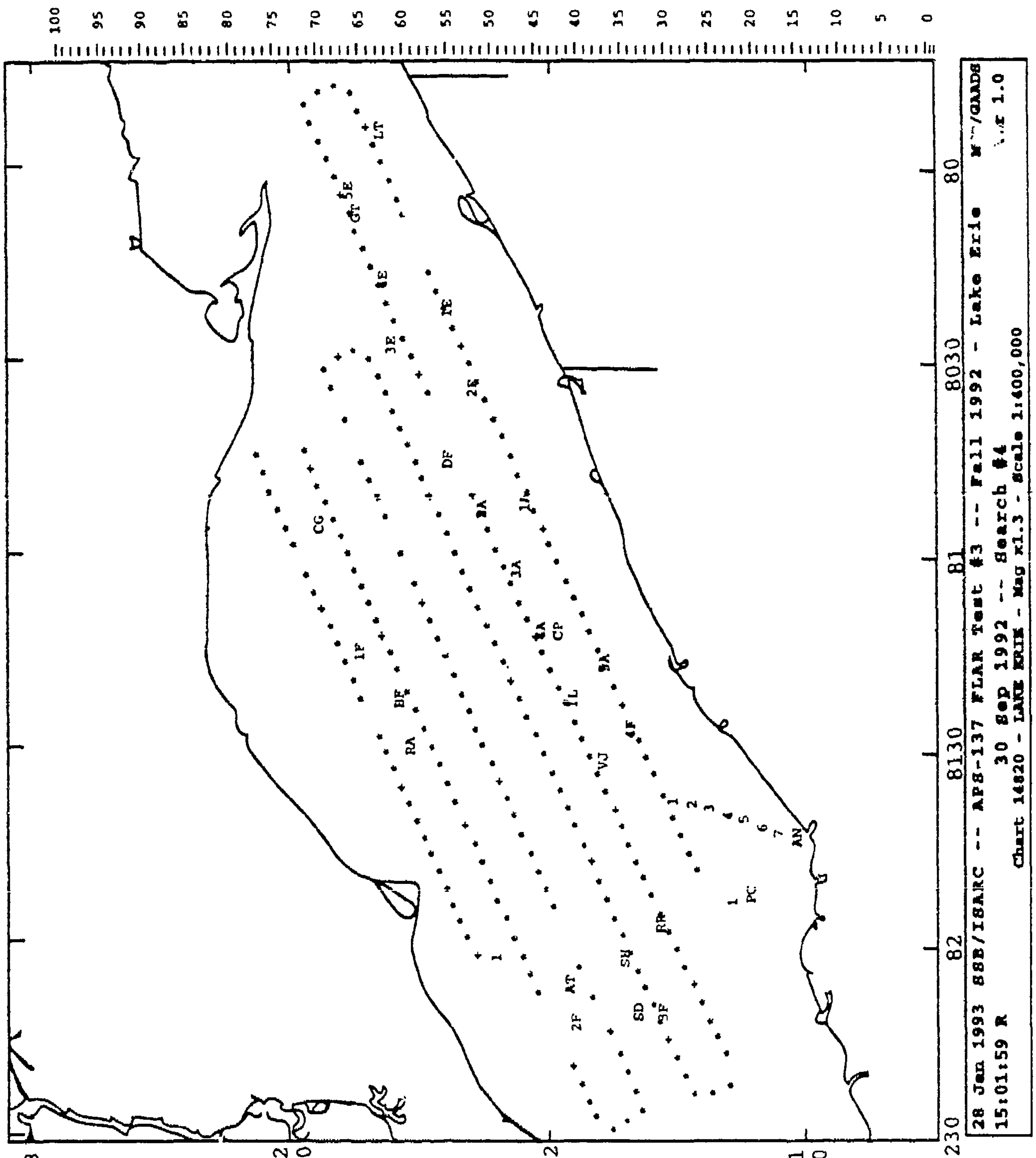

Figure 1-6. Example of a Reconstructed Search Plot

Table 1-4. Search Parameters

	Parameter	Unit of Measure	Measured Range of Values
Target	type	life raft	0
		small boat wood = 2, fiberglass = 3, metal = 4	2,3,4
	size	capacity for life rafts	4,6,10
		length overall (ft) for small boats	20 to 35
	lateral range	nautical miles	0 to 29.4
SRU	search speed	knots	180 to 220
	search altitude	feet	1000, 1500, 2000
	range scale	nautical miles	8, 16, 32
	relative bearing	degrees	-120 to 120
Environment	precipitation	none(0)/light(1)/moderate(2)/heavy(3)	0, 1
	significant wave height	feet	1.0 to 3.6
	whitecap coverage	none(0)/light(1)/moderate(2)/heavy(3)	0, 1, 2
	relative wave direction	into wave direction (+1) across wave direction (0) away from wave direction (-1)	-1, 0, 1
	wind speed	knots	1.0 to 15.2
Human Factor	time on task	hours	0 to 5.5

1.4 ANALYSIS APPROACH

1.4.1 Sweep Width Measure of Search Performance

The primary performance measure used by search and rescue mission coordinators to plan searches is sweep width (W). Because this evaluation supports improved Coast Guard search and rescue mission planning, the measure of search performance for this analysis is also sweep width.

Sweep width is a single-number summation of a more complex range/detection probability relationship. Mathematically,

$$W = \int_{-\infty}^{\infty} P(x)\,dx$$

where

x = Lateral range (see figure 1-7), and
P(x) = Target detection probability at lateral range x.

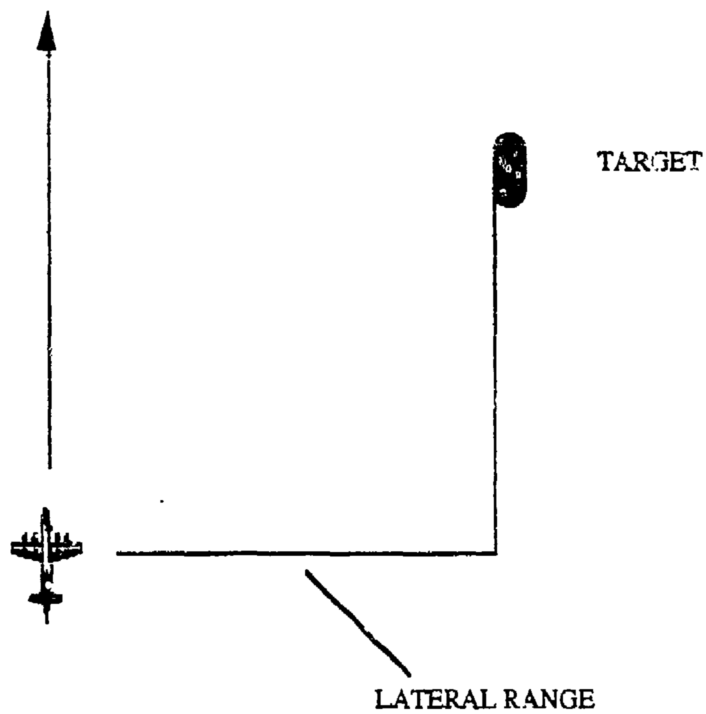

Figure 1-7. Definition of Lateral Range

Figure 1-8 shows a typical P(x) curve as a function of lateral range. In this figure, x is the lateral range of detection opportunities.

Conceptually, sweep width is the numerical value obtained by choosing a value of lateral range that is less than the maximum detection distance for any given sweep, such that the number of scattered targets that might be detected beyond the chosen value of lateral range is equal to the number that might be missed which are closer than the chosen lateral range. Figure 1-9 (a and b) illustrates this concept. The number of targets missed inside the distance W is indicated by the shaded portion - area A. The number of targets detected beyond the distance W out to the maximum detection range (MAX R_D) is indicated by the shaded portions at the tails of the curve - areas B. Sweep width is defined when the number of targets missed inside of W equals the number detected outside of W (area A = sum of areas B). A detailed mathematical development and explanation of sweep width can be found in reference 5.

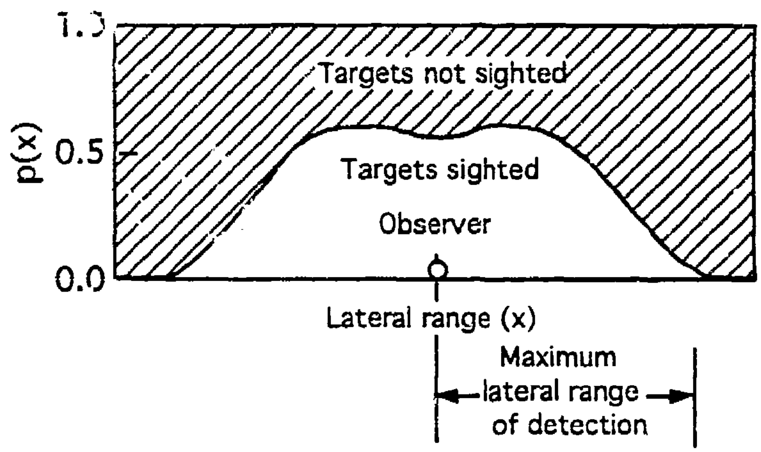

Figure 1-8. Relationship of Targets Detected to Targets Not Detected

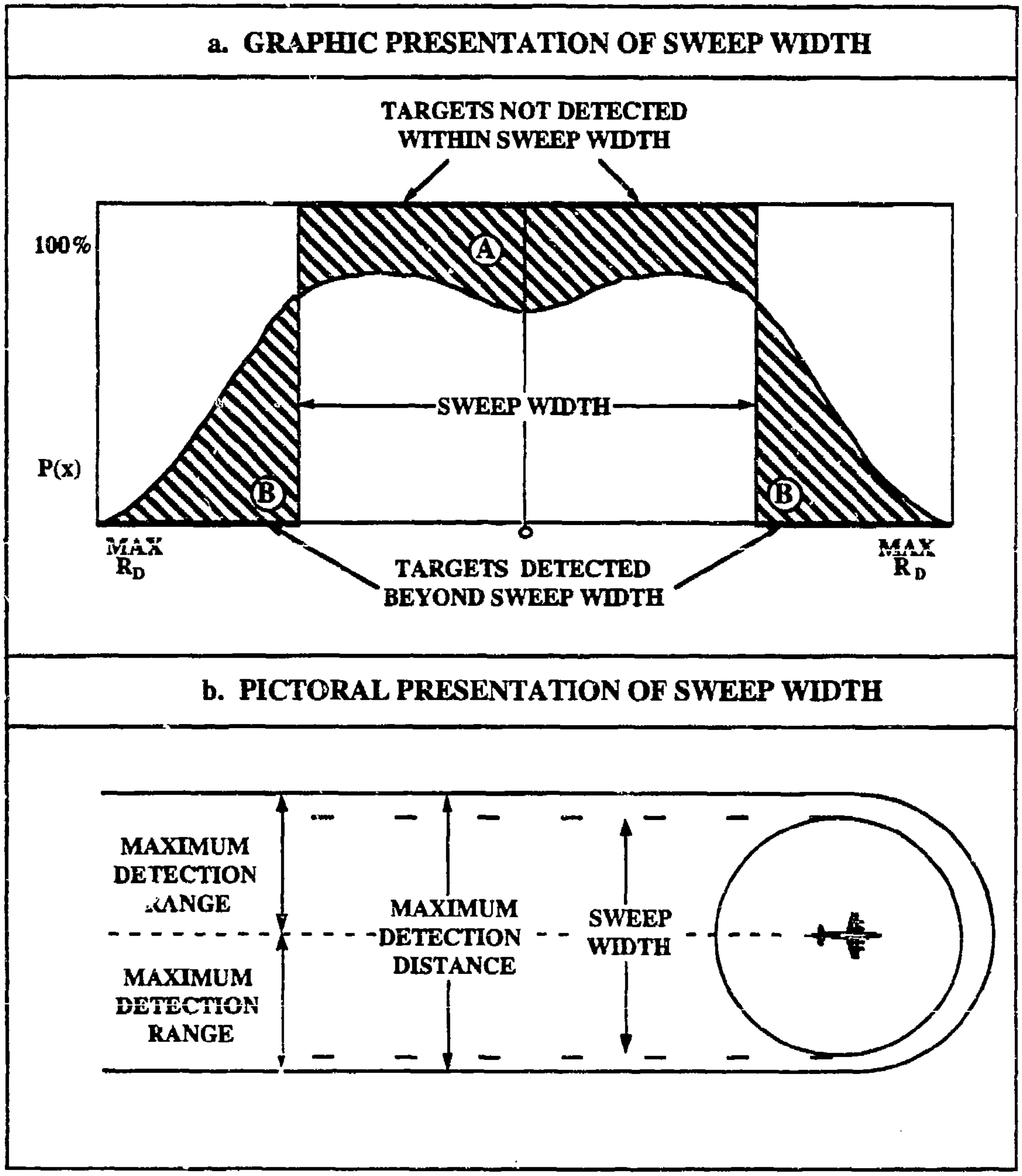

Figure 1-9. Graphic and Pictorial Presentation of Sweep Width

1.4.2 Analysis of Raw Data

Multivariate logistic regression has typically been used for electronic search to determine the significant variables for detection and the best curve fit for a monotonically decreasing data distribution. This method, however, cannot be used (without some constraints) for airborne radar detection data, which are peaked or unimodal. Once the constraints are applied and the significant variables identified, least squares linear regression technique must be applied to a chosen theoretical model of the data distribution, to determine a best fit curve.

1.4.2.1 Development of Raw Data

The reconstructed plots, AN/APS-137 FLAR detection logs, and recorded radar displays were used to determine which SRU-target encounters were valid detection opportunities and which opportunities resulted in successful target detections. Each target detection and each missed detection was recorded, along with the corresponding search parameter values, into EXCEL spreadsheets for further analysis using SYSTAT, a statistical analysis package installed on an Apple Macintosh Quadra 840AV.

1.4.2.2 Data Sorting and Statistics

The data sorting, statistical calculations, and plots were done using SYSTAT. The search runs were combined to form one composite data set. The search parameters were plotted as histograms and scatter plots and the minimum, maximum, mean, and standard deviation were calculated to determine the high-level statistics for each parameter. The search parameters that were well represented over the range of values were chosen. These parameters were then used to statistically characterize the AN/APS-137 FLAR performance. Once the parameters to be analyzed were chosen, logistic multivariate regression analysis determined which of those search parameters exerted significant influence on detection performance at a 90-percent confidence level. These parameters were used to separate the data into groups based on the effects of each significant variable on detection performance. The logistics regression was performed using LOGIT, an add-on module to SYSTAT.

1.4.2.3 LOGIT Multivariate Regression Model

Multivariate logistic regression models have been proven effective for analyzing Coast Guard electronic and visual search data when the dependent variable is a discrete response (i.e., detection/no detection). The LOGIT multivariate regression model quantified the relationship between independent variables (x_i) and a probability of interest, R (the probability of detecting a target). The independent variables (x_i) can be continuous (e.g., wave height, wind speed) or binary (e.g., high/low altitude, SRU type 0 or 1). Lateral range is normally the most significant variable in determining radar probability of detection. However, inspection of the raw data for many target/sensor/range scale combinations indicated that the monotonic curve shape to which the LOGIT model is constrained would not adequately represent the observed radar detection performance as a function of lateral range. Figures 1-10 and 1-11 illustrate the problem encountered. Whereas the LOGIT model attempts to fit a monotonically increasing or decreasing S-shaped lateral range curve similar to those illustrated in figure 1-10, the raw data in most cases indicated that the unimodal (or peaked) lateral range curve shape depicted in figure 1-11 was more appropriate. LOGIT could be used to identify variables, other than lateral range, that were significant in determining probability of detection.

The equation for target detection probability used in the logistic regression model is:

$$R = \frac{1}{1 + e^{-\lambda}}$$

where

$R =$	target detection probability for a given searcher - target encounter,
$\lambda =$	$a_0 + a_1x_1 + a_2x_2 + a_3x_3 + \ldots + a_nx_n$,
$a_i =$	fitting coefficients (determined by regression), and
$x_i =$	independent variable.

Maximum log-likelihood optimizes the a_i coefficients. A detailed theoretical development of the logistic regression analysis methodology is found in references 6 and 7.

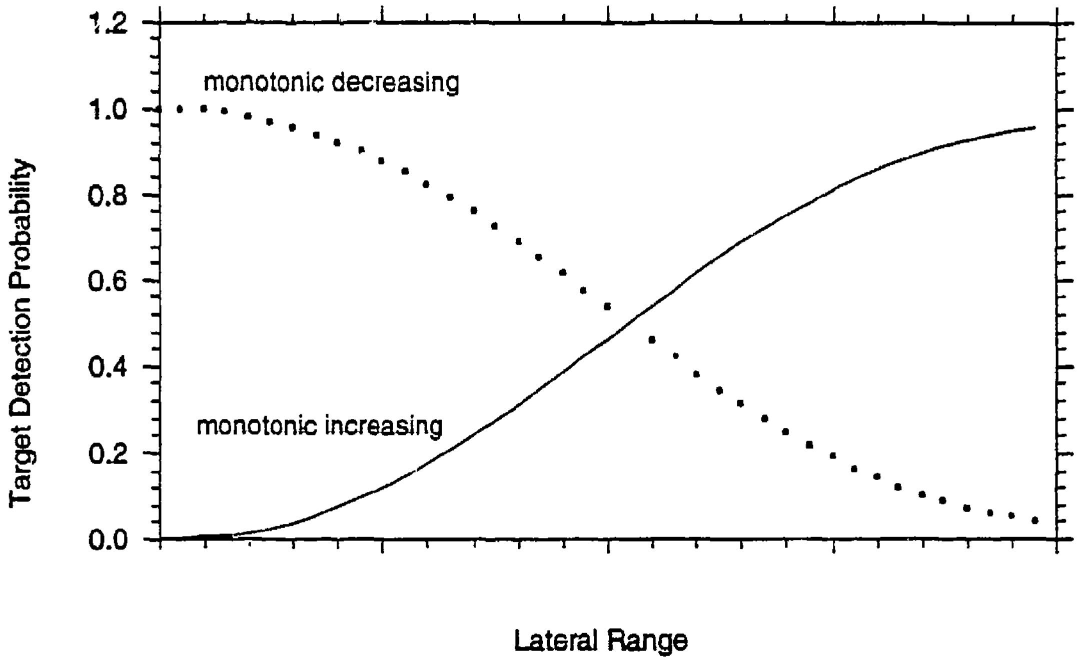

Figure 1-10. S-Shaped Curves

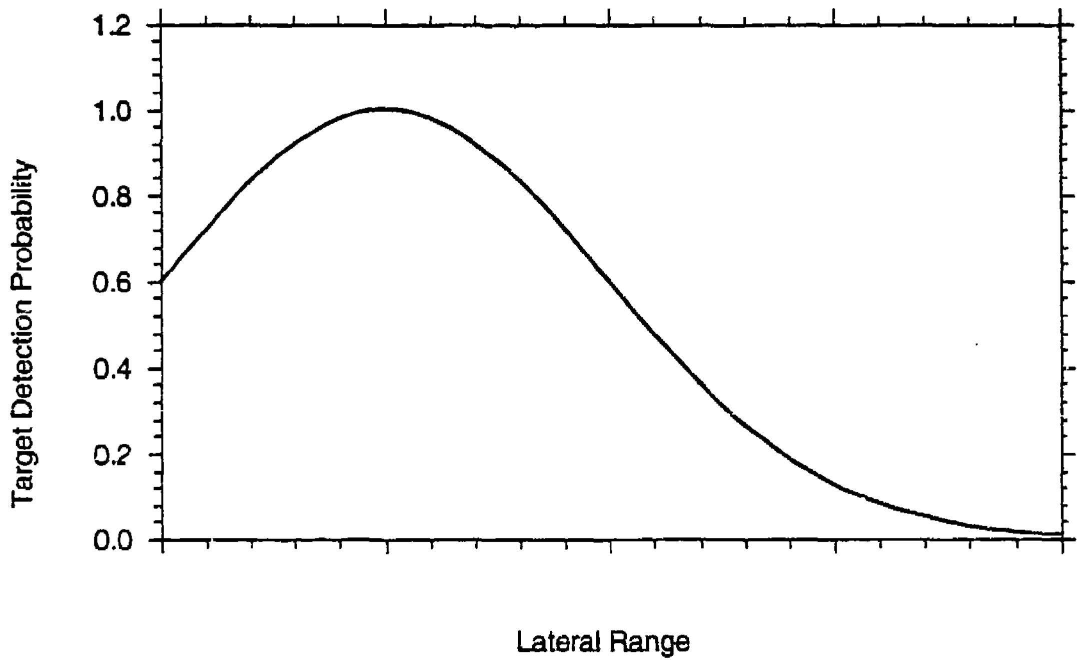

Figure 1-11. Unimodal Curve

A logistic regression model has advantages over other regression models and statistical methods.

1. The model implicitly contains the assumption that $0 \le R \le 1.0$; a linear model does not contain this assumption unless it is added to the model (in which case computation can become very difficult).

2. The model is analogous to normal-theory linear models. Therefore, analysis of variance and regression implications can be drawn from the model.

3. The model can be used to observe the effects of several independent or interactive parameters that are continuous or discrete, even for distributions that do not obey the inverse cube law of detection.

4. A regression technique is better than nonparametric hypothesis testing, which does not yield quantitative relationships between the probability in question and the independent variables.

The primary disadvantage of a logistic regression model is that for the basic models, the dependent variable (R) must be a monotonic function of the independent variables. This limitation can sometimes be overcome by employing appropriate variable transforms (reference 6).

The AN/APS-137 FLAR detection data were analyzed on a Macintosh Quadra 840 AV desktop computer with LOGIT software. LOGIT uses maximum log-likelihood to determine the influence of various independent explanatory variables in a discrete-choice response. The t-statistics output indicated the significance of these explanatory variables as predictors of the response (reference 7).

Using all of the chosen analysis parameters as a starting point, iterative use of the LOGIT regression model on each data set fit a function that contained only those search parameters that exerted a statistically-significant influence on the target detection response. The variables that were evaluated for this data set were from those listed in table 1-4 that were well represented over a wide enough range of values to present a meaningful analysis. Those variables that had previously demonstrated a significant influence on AN/APS-131 Side-Looking Airborne Radar (SLAR) and AN/APS-127 FLAR search performance (reference 8) were also evaluated for significance in the data set.

1. Wind speed,
2. Significant wave height[2],
3. Search altitude,
4. Relative swell direction,
5. Target type and size,
6. Time-on-task, and
7. Whitecap coverage.

Radar parameters, other than those listed, were either held constant or adjusted as required by the sensor operators to achieve optimum small-target detection performance. Such variables were not considered for data analysis.

1.4.2.4 Least-Squares Curve Fits

In order to fit a lateral range curve to the detection data that exhibited unimodal response, an appropriate fitting function had to be identified. During analysis of the previous FLAR and SLAR data, it was found that the function

$$P(x) = \frac{A}{(x - B)^2 + C},$$

where A, B, and C are regression variables and x is lateral range, could be fitted satisfactorily to all of the unimodally behaved data sets using the Simplex least-squares regression method (see reference 8). This technique was used to develop the lateral range curves and sweep widths that appear in chapter 2.

Although necessary to accommodate the unimodal curve shapes, the least-squares regression method is a less satisfactory means of analyzing detection data than the LOGIT regression method. Specifically, the least-squares method has the following limitations that LOGIT does not.

1. The least-squares technique fits a function to a single, independent variable only (lateral range in this case), instead of to multiple parameters of interest. The effects of other parameters cannot be identified or quantified.

[2] Significant wave height is defined in reference 9 as the height (in feet) an experienced observer will give when visually estimating the height of waves at sea.

2. The binary detection/miss data must be binned into lateral range intervals, each of which should contain a reasonable number of detection opportunities before being entered into the regression model.

3. The least-squares regression variables (A, B, and C) have no physical significance relative to the detection process: They simply serve to adjust the fitting function's response to the independent variable lateral range.

4. The least-squares method of curve fitting is very sensitive to data outliers.

These limitations require that the detection data be subjected to a multistep analysis using the LOGIT regression model initially to identify variables, other than lateral range, that exerted significant influence on target detection probability. Variables identified as significant during this LOGIT analysis were grouped into bins to create data subsets that were, in turn, binned on lateral range. Finally, the lateral range and target detection probability pairs obtained in this manner were input to a least-squares regression program, along with reasonable starting estimates for the regression variables A, B, and C. Using this three-step process, lateral range curve functions were developed for various combinations of the significant search parameters.

1.4.2.5 Sweep Width Calculations

The lateral range functions obtained from the procedures described in section 1.4.2.4 were integrated over the radar range scale to obtain sweep width estimates for the AN/APS-137 FLAR under given environmental conditions. The integral of the unimodal function is:

$$W = \frac{A}{\sqrt{C}} \arctan\left(\frac{x-B}{\sqrt{C}}\right)\Bigg|_{x=-\infty}^{x=\infty},$$

or given the limits of the radar

$$W = 2 * \frac{A}{\sqrt{C}} \arctan\left(\frac{x-B}{\sqrt{C}}\right)\Bigg|_{x=0}^{x=x_{max}},$$

where

W	=	sweep width,
A, B, and C	=	least squares fitted variables, and
x_{max}	=	the range scale of the radar.

The integral of the best fit curve for the data sets analyzed closely matched the numerical integration values using Simpson's 1/3 rule. For sufficiently large data sets, the sweep width can also be calculated with reasonable assurance of accuracy using an appropriate numerical integration method.

CHAPTER 2
EXPERIMENT RESULTS AND ANALYSIS

2.1 INTRODUCTION

The data analyses discussed in section 2.2 cover sweep width calculations for life rafts and small boats under a variety of environmental conditions. Quantitative and qualitative evaluations of the effects of human factors on detection performance are discussed in section 2.3. The analysis is confined to the factors mentioned in Chapter 1. The effects of environmental phenomenon such as ducting are beyond the scope of this set of experiments. During the Spring 1992 and Fall 1992 experiments, 908 life-raft detection opportunities were generated. The Fall 1992 experiment generated 584 small boat detection opportunities. Due to the concern that during the Spring 1992 experiment the radar operators were instructed to search for rafts only and not mid-size targets, small boat detection opportunities from this experiment were not included. The raw data for the two experiments are presented in Appendix A.

The wave data from Lake Erie (Fall 1992) were compared to the wave data from the Gulf of Mexico (Spring 1992) to determine if the two data sets could be combined into one data set. The wave energy spectra for each data set were compared for physical differences in the magnitude and types of waves present. For low significant wave heights ($H_S \leq 2.0$ feet), the Gulf wave spectrum showed some difference in amplitude from the Erie wave spectrum for the low frequency waves (long swells). The higher frequency wind-driven waves were approximately the same amplitude. For the higher values of H_S (2.1 to 4.2 feet), the Erie and Gulf wave energy spectra were approximately the same for all frequencies. For the purpose of this analysis, low frequency gravity waves were assumed to cause no significant masking of life-raft targets. Also, for the radar frequencies used, the long swells were assumed to have a negligible effect on surface backscatter (reference 10), and all of the radar display clutter were assumed to be caused by the high frequency wind driven waves.

The detection data versus significant wave height (H_S) were then compared to determine if there was a difference between locations. The distribution of H_S values in Lake Erie for the Fall 1992 experiment showed most of the H_S to be at one value (2.3 feet) and that all other values of H_S did not have enough data for a valid comparison to the Spring 1992 data. The detection data at H_S equal to 2.3 feet showed no significant difference at the 90-percent confidence level. It was assumed that, given more data, the other H_S value detection data would also show no

significant difference. For this analysis, the life-raft data from the two experiments were combined to form one data set.

2.2 DETECTION PERFORMANCE

Sections 2.2.1 and 2.2.2 present results of the sweep width analysis of the AN/APS-137 FLAR searching for life-raft and small boat targets. Lateral range curves and sweep width estimates are provided for each target type search parameter combination that was sufficiently represented in the data. Lateral range and range scale were identified as significant search parameters for all combinations and were the variables of most concern when planning a search.

The lateral range plots show lateral range versus the probability of detection (Pdet) within a specified lateral range window. Figure 2-1 is an example of a lateral range plot with a key to the plot. Each probability plotted is denoted by a diamond (♦) corresponding to the detection-to-opportunity ratio. The vertical bar through each "♦" denotes the 90-percent confidence interval for the data within the bin. The position of the "♦" along the horizontal axis corresponds to the average lateral range within each lateral range bin. The values for the constants that were used to generate each of the curves are presented in Appendix B.

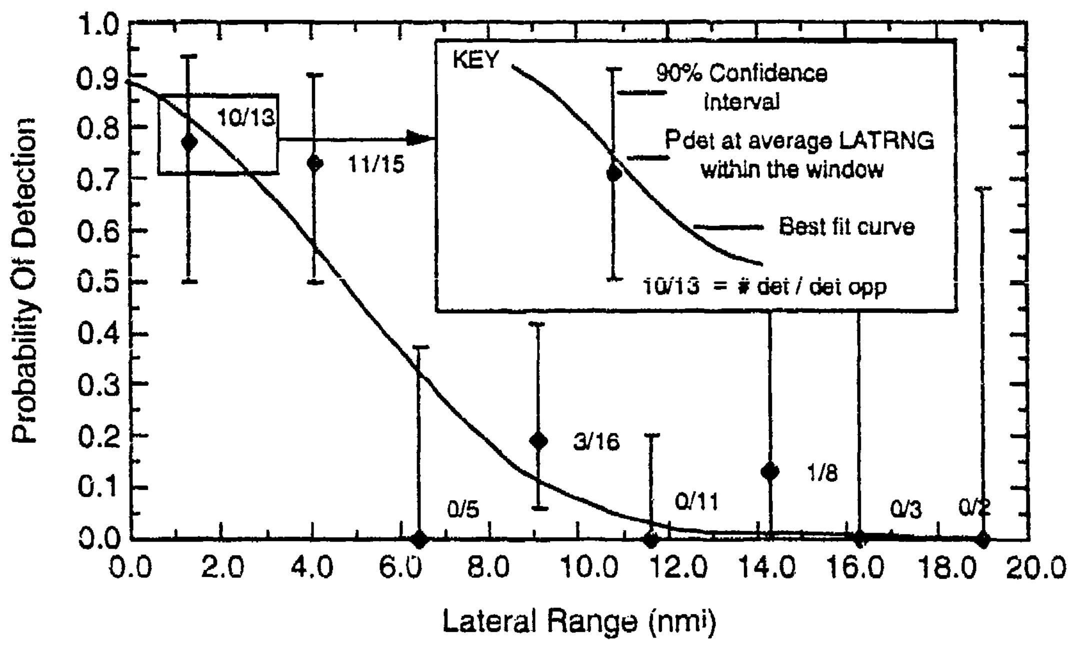

Figure 2-1. Example of Lateral Range Plot

2.2.1 Life-Raft Targets

2.2.1.1 AN/APS-137 FLAR Performance

The data for life-raft detections were analyzed using LOGIT and a least-squares analysis for variables that had a significant influence on detection performance at the 90-percent confidence level. The significant variables for life rafts are:

- Lateral range,
- Radar range scale, and
- Wind speed.

During the Fall 1992 experiment, data were collected for the 16- and 32-nmi range scales. These data were added to the Spring 1992 data which were all at 16-nmi range scale. The range scale was shown to have a significant effect on detection performance, and the data were grouped by range scale into two different subsets. Table 2-1 shows the detection opportunity results for each subset.

The 16-nmi range scale data showed a breakpoint in detection performance at a wind speed of 8 knots. Because an 8-knot breakpoint also resulted in two well-represented data groups, the life-raft data were pooled into two data subsets that were each analyzed to determine sweep width characteristics. The subsets are the following:

1. Wind speed 1.0 to 8.0 knots (454 opportunities), and
2. Wind speed 8.1 to 15.2 knots (231 opportunities).

Table 2-1. Detection Data for Life Rafts 16- and 32-nmi Range Scales

Range Scale (nmi)	Number of Opportunities	Number of Detections
16	685	180
32	223	12

Figure 2-2 illustrates the results of the AN/APS-137 FLAR detection performance for the 16-nmi range scale for wind speeds from 1.0 to 8.0 knots. The results show a peak at 1.9 nmi with a maximum Pdet of 0.58. The Pdet then decreased steadily to the edge of the range scale. No detections were made beyond a lateral range of 14.0 nmi. These results are consistent with results seen in earlier experiments (references 4 and 8). Figure 2-3 illustrates the results of the detection performance for the 16-nmi range scale where the wind speed was from 8.1 to 15.2 knots. Above 8.0 knots, the detection performance of the AN/APS-137 FLAR decreased steadily up to 15.2 knots (reference 4). The detection performance for the higher wind speed data was noticeably worse at all lateral ranges than that of the lower wind speed data. The results agree with the predicted relative performance (reference 10).

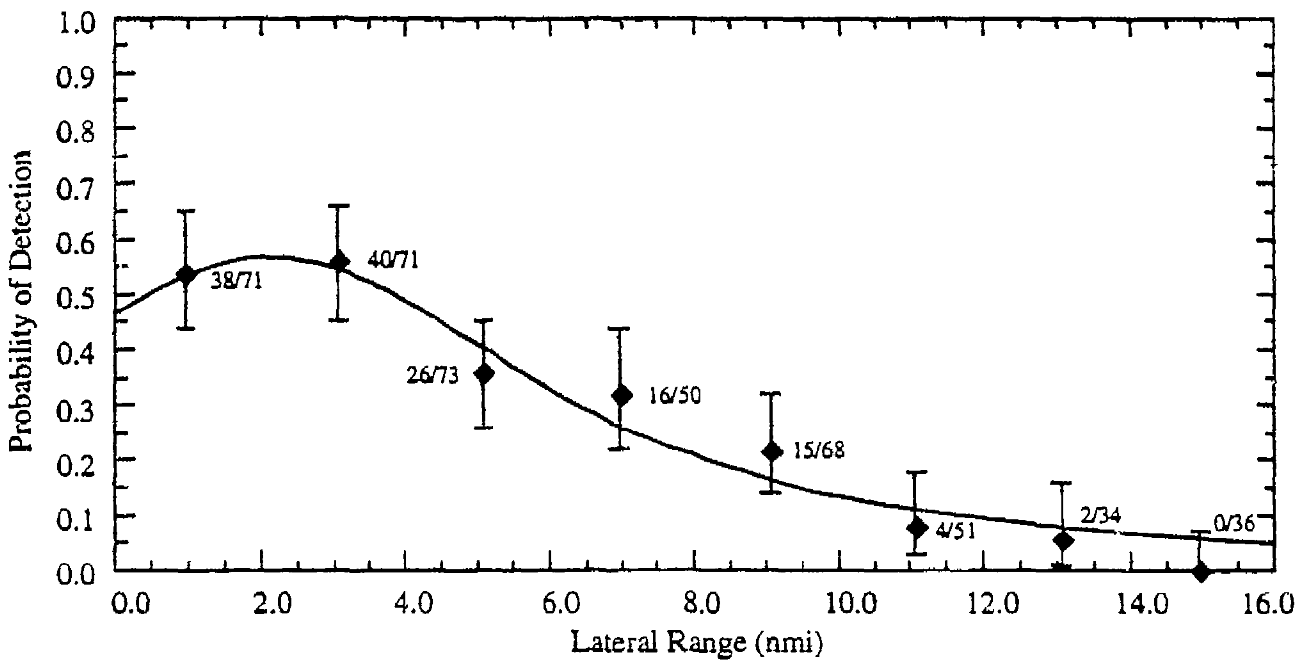

Figure 2-2. AN/APS-137 FLAR Detection of Life Rafts
(16-nmi Range Scale; Wind Speed = 1.0 to 8.0 knots)

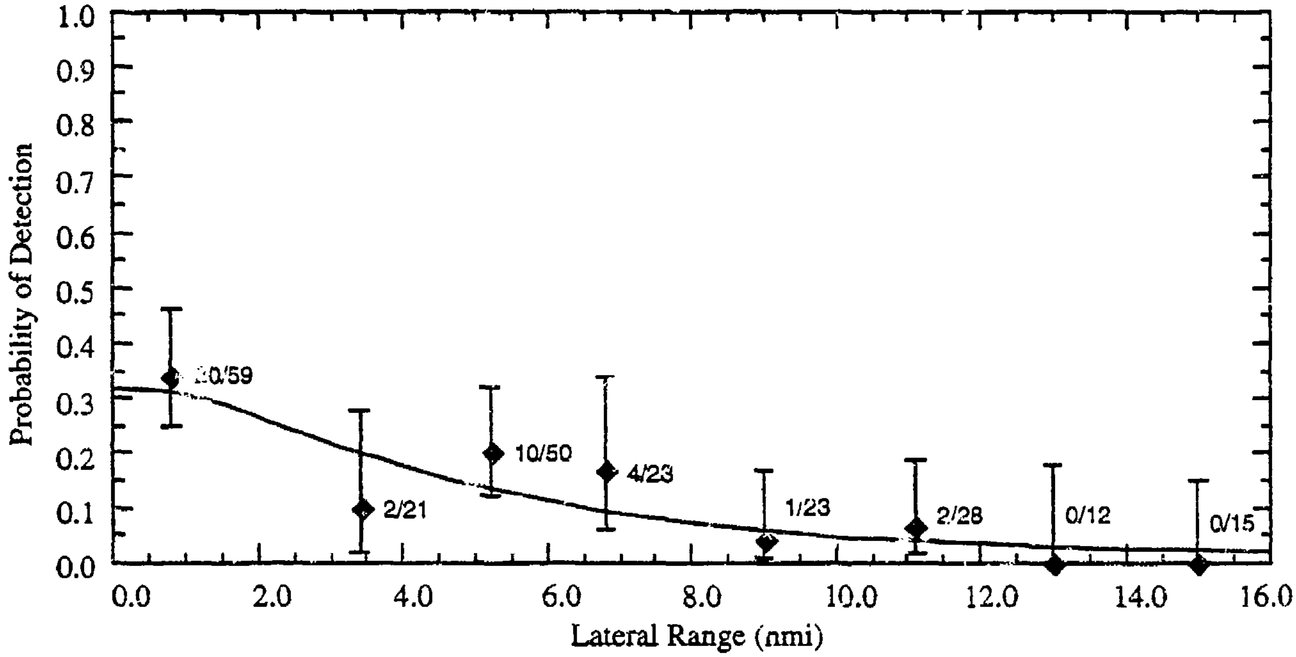

Figure 2-3. AN/APS-137 FLAR Detection of Life Rafts
(16-nmi Range Scale; Wind Speed = 8.1 to 15.2 knots)

The scarcity of low Hs (<1.5 feet) data for the Fall 1991 experiment was most likely the reason that Hs was identified as a significant variable for the Spring 1992 data set and not for the combined data set. Also, sea surface wind speed is typically a better predictor of the wind driven waves which creates the scattering facets on the water surface, creating most of the radar clutter. For this reason, near-surface wind speed may be a more reliable variable to use in modeling the detection performance of the AN/APS-137 FLAR. Additional data are needed to fill the void in significant wave height data for a more complete analysis.

The results of the sweep width analysis are shown in table 2-2.

Table 2-2. Sweep Width Analysis for Life Rafts using 16-nmi Range Scale

Wind Speed (knots)	Average Wind Speed (knots)	Sweep Width (W) (nmi)
1.0 to 8.0	6.0	8.8
8.1 to 15.2	10.3	3.8

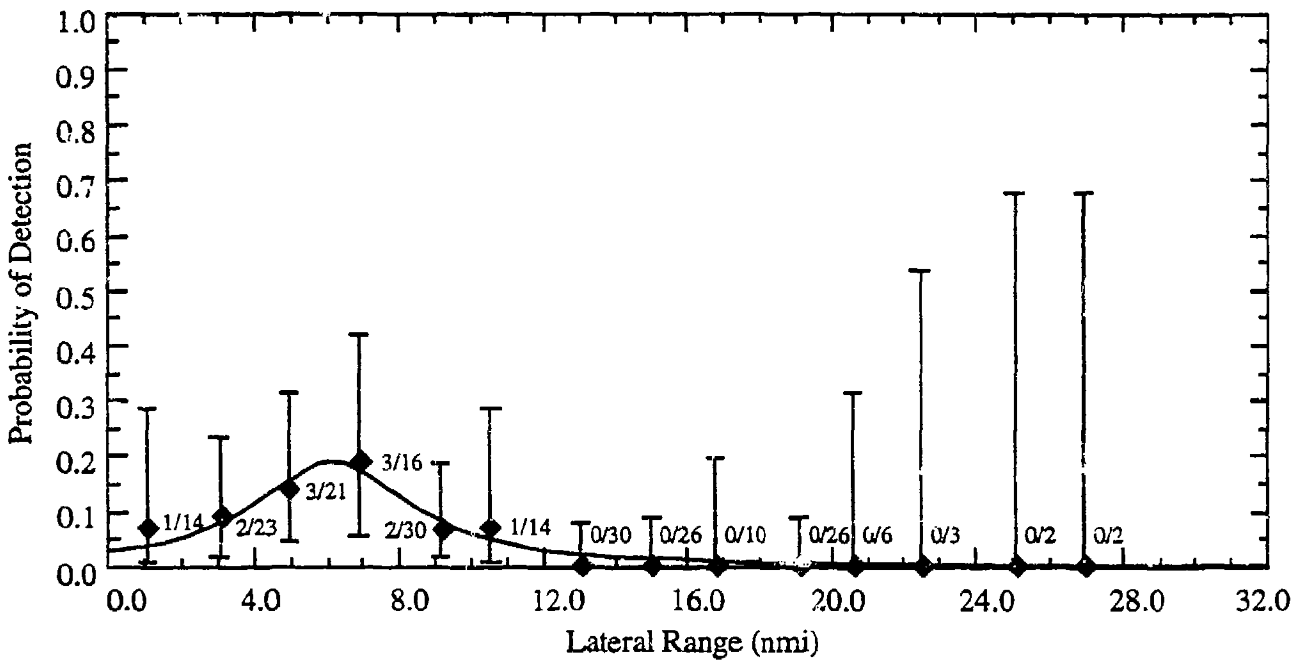

Figure 2-4. AN/APS-137 FLAR Detection of Life Rafts
(32-nmi Range Scale)

Figure 2-4 illustrates the AN/APS-137 FLAR detection performance for life rafts for the 32-nmi range scale. From 0 to 16 nmi, the 16-nmi range scale performed significantly better than the 32-nmi range scale. Since there were no detections in the 32-nmi range scale beyond 12 nmi, there was no advantage gained by searching at the longer ranges. The loss of resolution severely degrades the performance of the radar against low cross-section targets. The 12 detections for the entire data set yielded a sweep width of only 2.7 nmi. The 32-nmi range scale should not be used for life-raft searches.

2.2.1.2 Comparison of Life-Raft Detection Performance of the AN/APS-137 FLAR to the AN/APS-127 FLAR

The combined data from the Spring 1992 and Fall 1992 experiments were compared to the corresponding data collected for the AN/APS-127 FLAR (reference 8). In order to compare the two radar capabilities, the AN/APS-137 FLAR data set was separated into two data subsets for H_S less than or equal to 2.0 feet and H_S between 2.0 and 3.6 feet. These criteria corresponded to

Table 2-3. AN/APS-137 FLAR and the AN/APS-127 FLAR
Life-Raft Sweep Width Values

Range Scale (nmi)	Significant Wave Height (ft)	AN/APS-137 Sweep Widths (nmi)	AN/APS-127 Sweep Widths (nmi)	Corrected * AN/APS-137 Sweep width
16/20	≤ 2.0	8.6	7.0	8.9
	2.1 to 3.9	6.8	3.4	7.1

* Presented only for comparison purposes and should not be used for operational use of the radar.

the AN/APS-127 FLAR data grouping. Table 2-3 compares the sweep widths generated for both radars. Sweep width calculations for the AN/APS-137 FLAR were also corrected for the difference in range scales (16 nmi versus 20 nmi) from the AN/APS-127 FLAR and are presented only for comparison purposes.

Figures 2-5 through 2-8 show the results of the comparison. The 20-nmi range scale of the AN/APS-127 FLAR was compared to the 16-nmi range scale of the AN/AP-137 FLAR. For the lower H_s data set, the overall detection performance of the AN/APS-137 FLAR did not appreciably differ from that of the AN/APS-127 FLAR. However, the AN/APS-137 FLAR did perform noticeably better than the AN/APS-127 FLAR for the higher H_s data set. As with the Spring 1992 data alone, there is degradation in the AN/APS-137 FLAR performance from 14 to 16 nmi when compared to the corresponding interval in the AN/APS-127 FLAR data. This is likely due to the difference in range scales (16 nmi versus 20 nmi) giving the AN/APS-127 FLAR operator more opportunity to see the target. However, the AN/APS-137 FLAR can not remedy this problem by switching to the 32-nmi range scale since on the 32-nmi range scale the radar display resolution critically degrades the ability to detect life-raft targets.

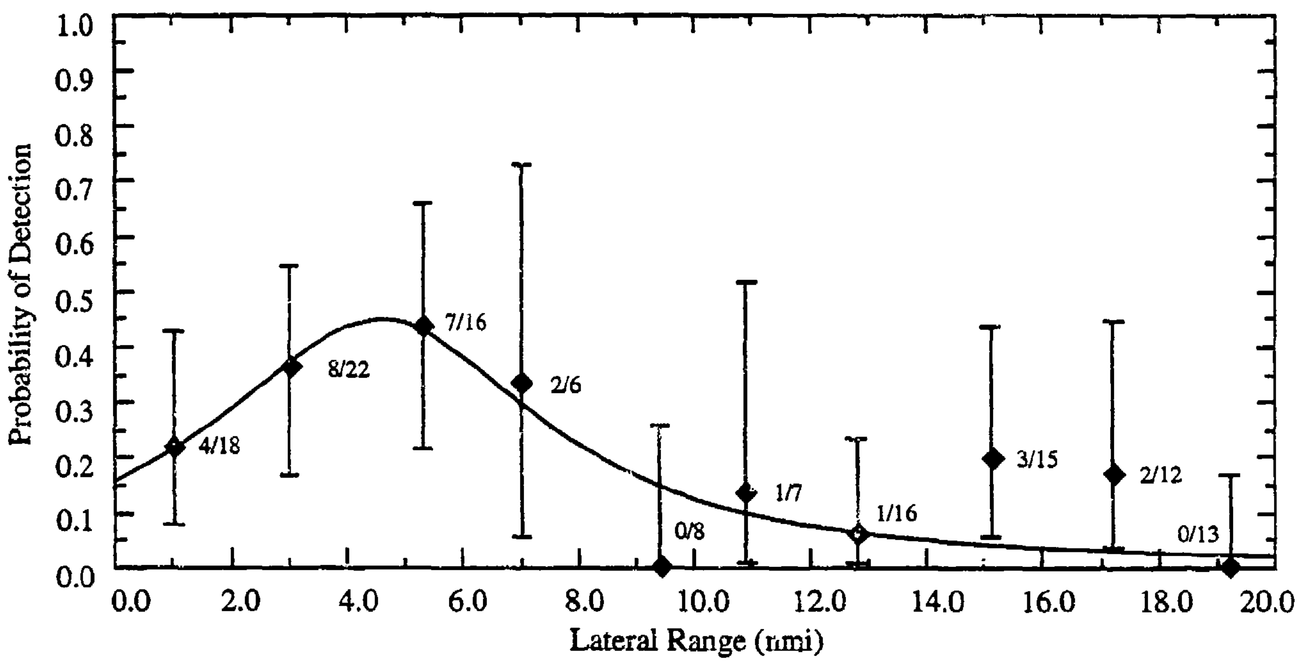

Figure 2-5. AN/APS-127 FLAR Detection of Life Rafts
(20-nmi Range Scale; $H_S \leq 2.0$ feet)

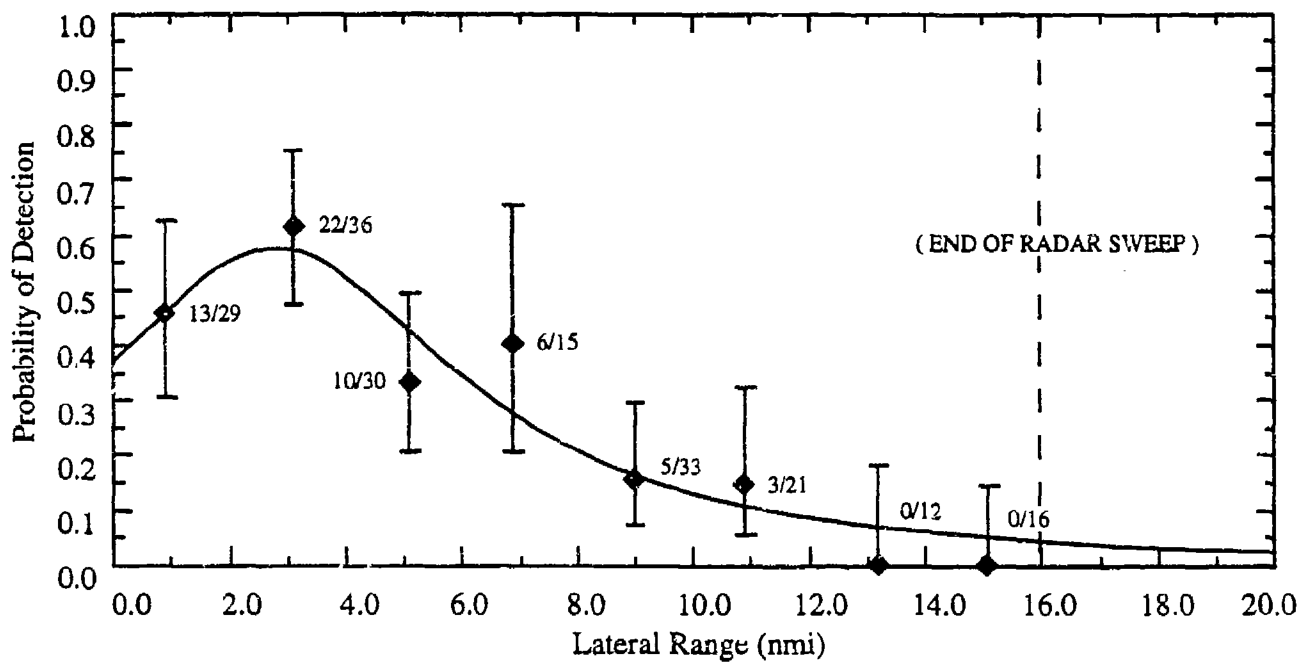

Figure 2-6. AN/APS-137 FLAR Detection of Life Rafts
(16-nmi Range Scale; $H_S \leq 2.0$ feet)

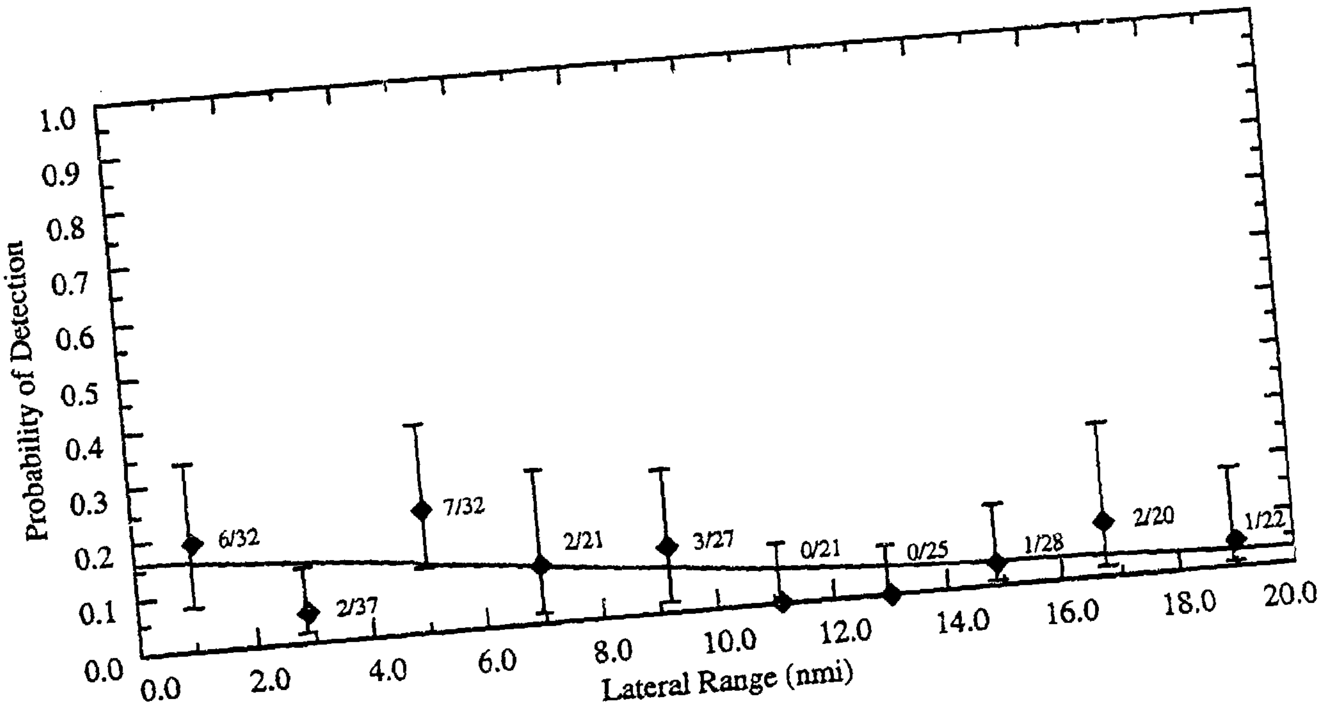

Figure 2-7. AN/APS-127 FLAR Detection of Life Rafts
(20-nmi Range Scale; H_S = 2.1 to 3.9 feet)

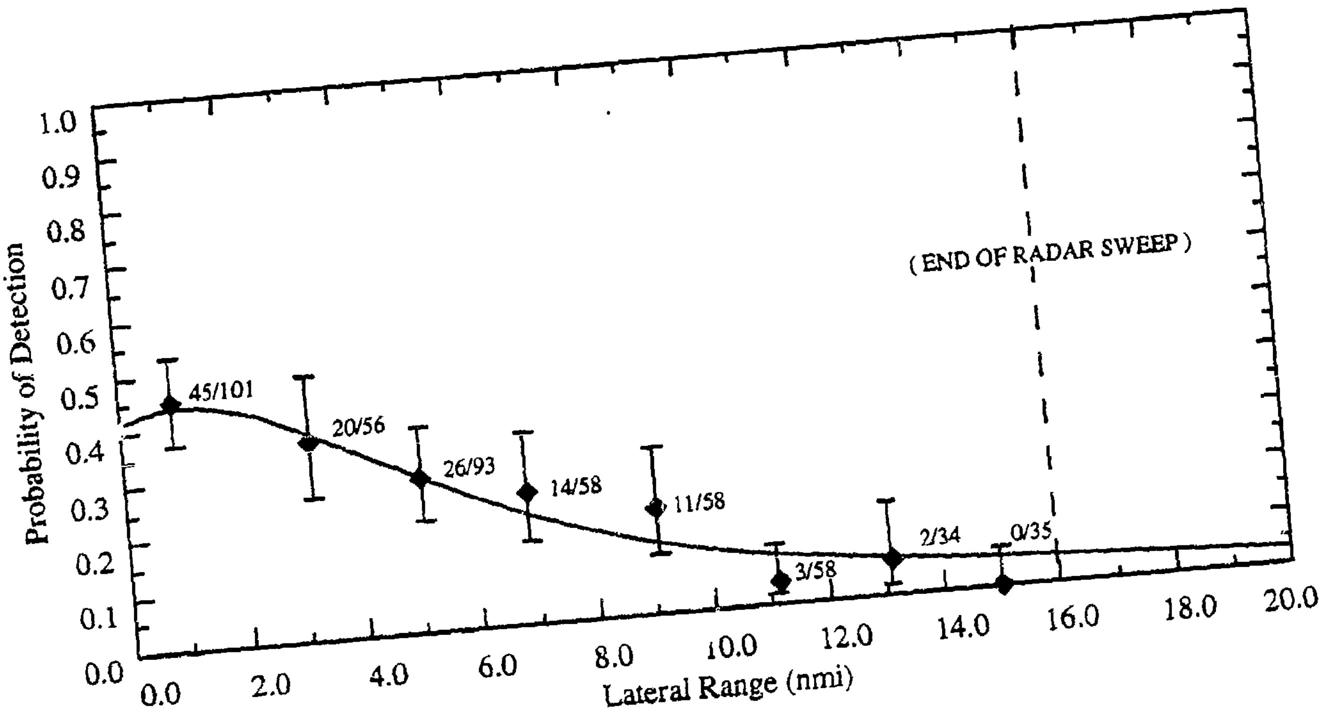

Figure 2-8. AN/APS-137 FLAR Detection of Life Rafts
(16-nmi Range Scale; H_S = 2.1 to 3.6 feet)

2.2.2 Small Boat Targets

2.2.2.1 AN/A 'S-1' / FLAR Performance

The data for small boat detections were analyzed using LOGIT and a least-squares analysis for variables that had a significant influence on detection performance at the 90-percent confidence level. The significant variables for small boats are:

- Lateral Range,
- Range Scale,
- Size, and
- Wind speed.

Hull composition was not well represented in the data set and it could not be adequately determined if this variable was a significant factor in determining detection performance. Because the Spring 1992 experiment had no small boat data that could be used, all of the small boat data were collected on Lake Erie. As with the life-raft data, the small boat data were grouped by range scale into two different subsets, 16 nmi and 32 nmi. When the Pdet was plotted against boat size, a significant increase in detections was evident for boat size greater than 25 feet. At 25 feet and below, boat size had a negligible effect on Pdet. Boats larger than 25 feet are likely to have flat-sided deckhouse rather than a faired cabin. Increasing size generally means an increasing amount of superstructure greatly increasing the boat's radar cross-section. Because 25 feet was a breakpoint for target detectability, each of the range scale data sets was grouped into subsets using the following boat size criteria:

1. $20 \leq$ size ≤ 25 feet, and
2. $25 <$ size ≤ 35 feet.

All environmental factors were evaluated for their effects on Pdet. Though H_S and wind speed were highly correlated (ρ = .78), H_S was not identified as a significant variable at the 90-percent confidence level. Wind speed, however, did have a significant effect on detection performance at the 90-percent confidence level. The small boat data were grouped by wind speed using the following criteria:

1. Wind speed $\leq$ 8.0 knots, and
2. Wind speed 8.1 to 15.2 knots.

Wind speed breakpoint of 8.0 knots provided a sufficiently large difference in generated sweep widths and an equitable distribution of the data.

Figures 2-9 through 2-16 illustrate the results of the AN/APS-137 FLAR performance. Table 2-4 summarizes the number of detections, opportunities, and calculated sweep widths for each of the eight data subsets.

The larger boats (most likely to have a deckhouse or superstructure) were considerably more detectable in the higher wind speed conditions. The large boat sweep width values for the higher wind conditions were more than double the corresponding sweep widths for the smaller boats using the 16-nmi range scale. The larger radar cross section greatly increases the signal-to-clutter ratio and results in the increased detectability. Though the data set for the 32-nmi range scale is small, the same trend can be seen. There is a considerable increase in detection performance between the smaller and larger boat size. The sharp drop in detection probability for the smaller boat data set for all conditions corresponds with the trend noted in the life-raft data. The lower cross section targets can easily be lost in high clutter situations, especially with the lower resolution of the 32-nmi range scale. There is a marked decrease in detection performance over the interval 0 to 16 nmi for the 16- to 32-nmi range scale for smaller boat size. The decrease is only marginal for the larger boat size data set.

The higher wind speeds resulted in smaller sweep widths for all boat sizes and range scales. For the 32-nmi scale (figure 2-13 through 2-16), it appears that the Pdet at shorter ranges (less than 4 nmi) is greater for the high wind data. This is due to the scarcity of data for the higher wind speeds. The good performance of the FLAR at short ranges in figures 2-14 and 2-16 is likely due to a large increase in signal strength of the return echo compared to the increase in clutter. A larger data set is needed to make a valid comparison.

The sweep widths for the same conditions are not significantly different for the two range scales. Any loss in detection performance due to the loss of resolution in the 32-nmi range scale is compensated by the longer detection ranges.

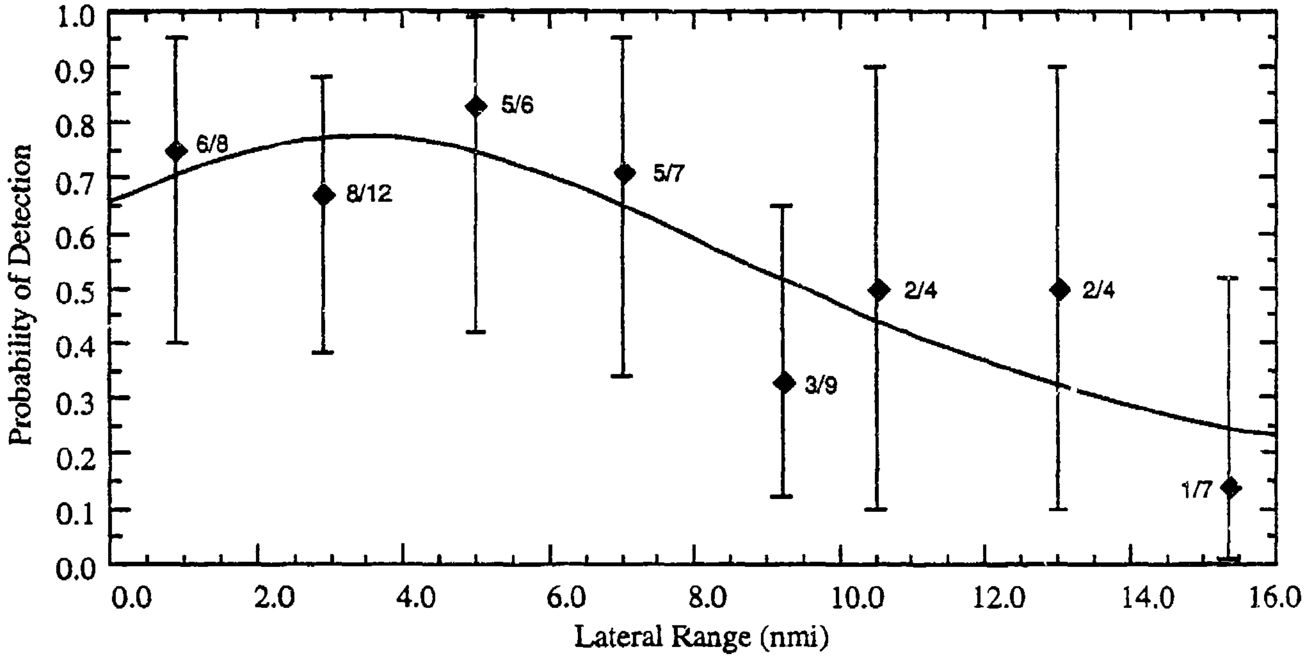

Figure 2-9. AN/APS-137 FLAR Detection of 20- to 25-foot Boats
(16-nmi Range Scale; Wind Speed ≤ 8.0 knots)

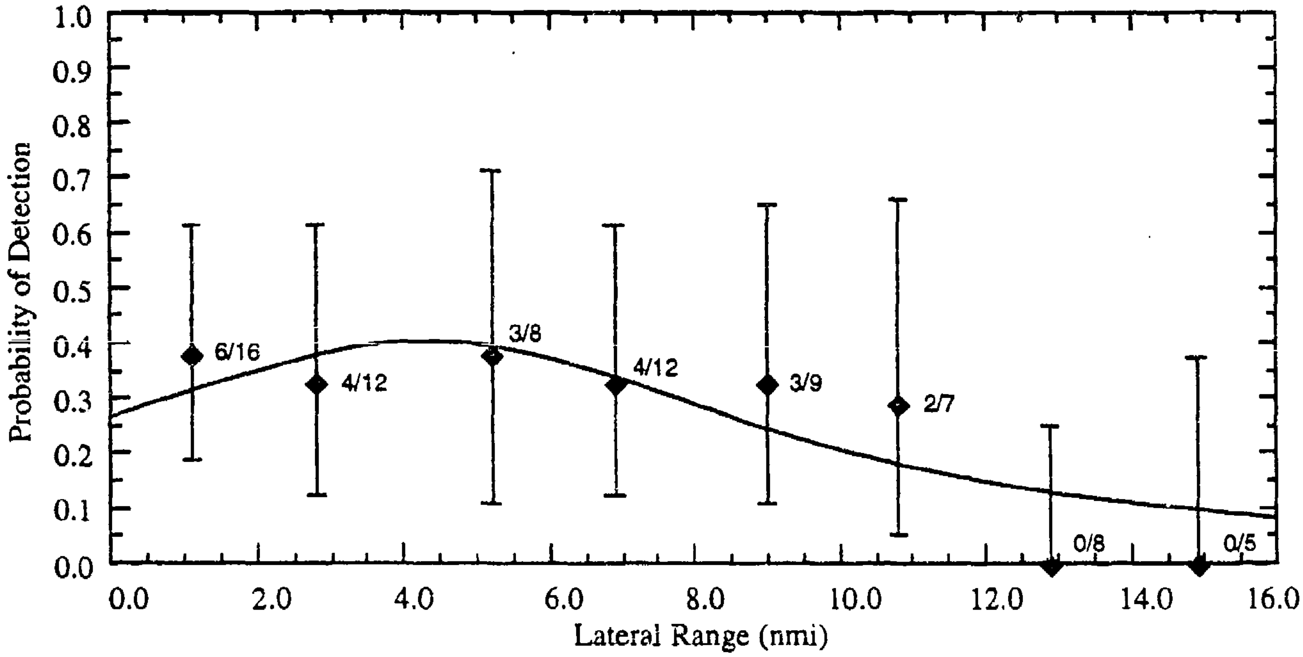

Figure 2-10. AN/APS-137 FLAR Detection of 20- to 25-foot Boats
(16-nmi Range Scale; Wind Speed = 8.1 to 15.2 knots)

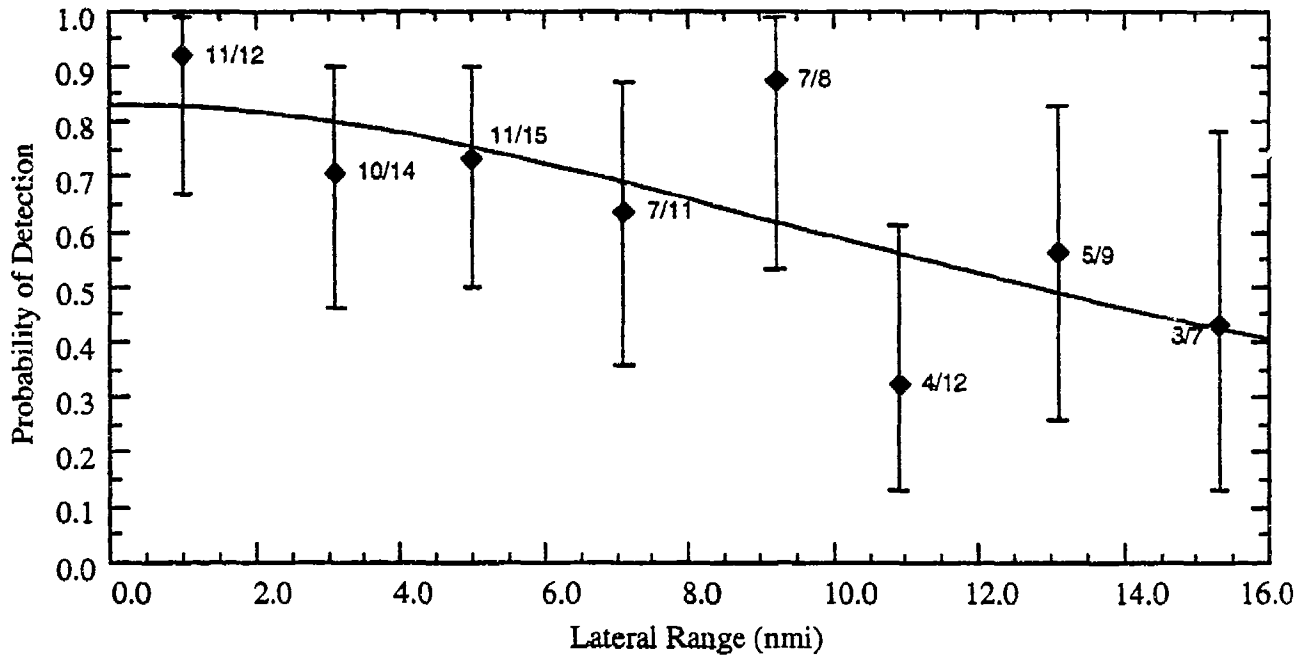

Figure 2-11. AN/APS-137 FLAR Detection of 26- to 35-foot Boats
(16-nmi Range Scale; Wind Speed ≤ 8.0 knots)

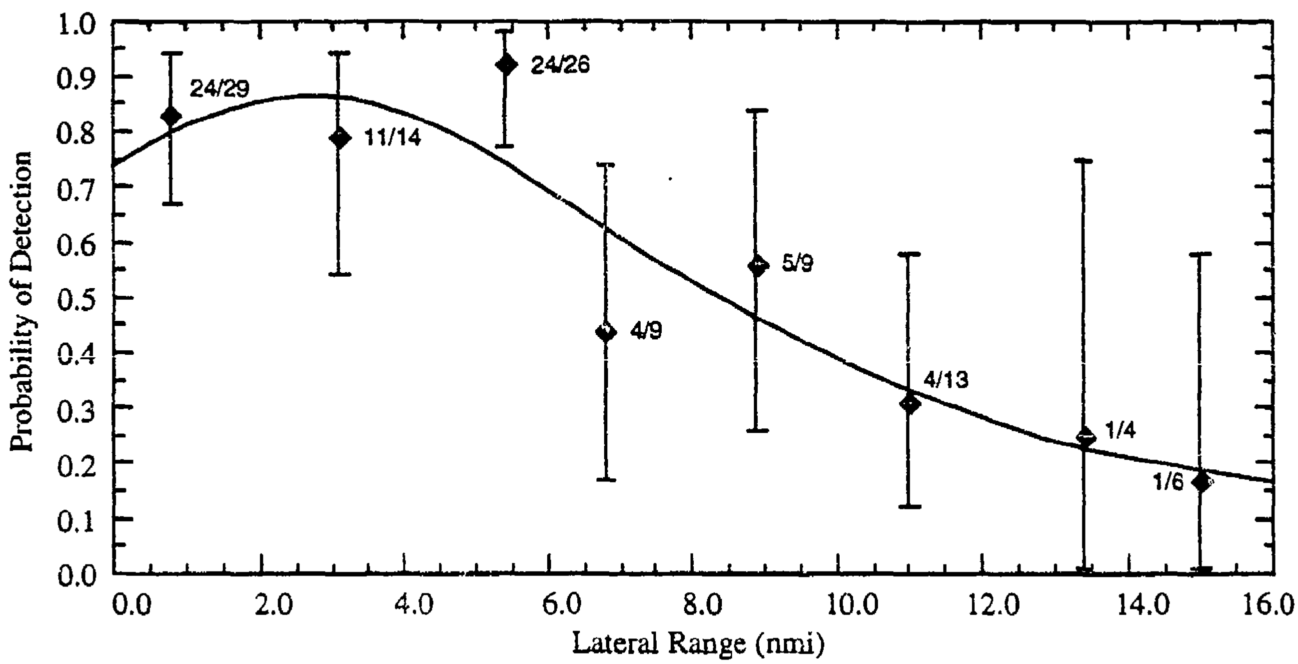

Figure 2-12. AN/APS-137 FLAR Detection of 26- to 35-foot Boats
(16-nmi Range Scale; Wind Speed = 8.1 to 15.2 knots)

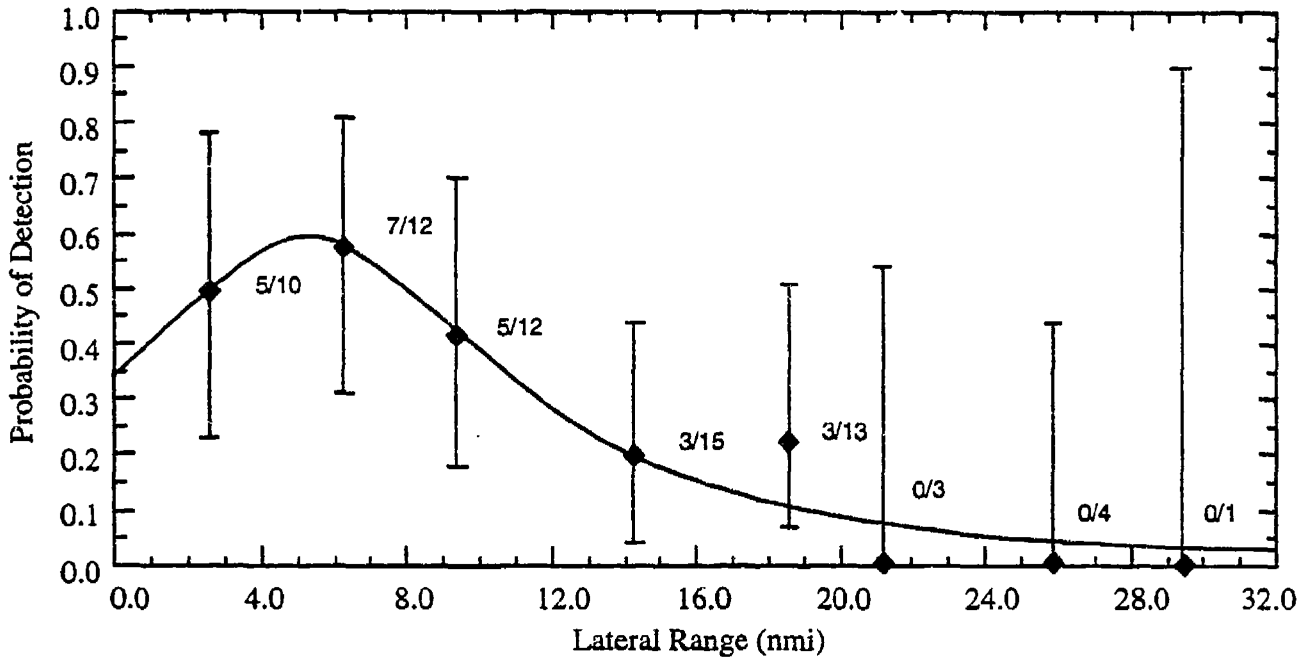

Figure 2-13. AN/APS-137 FLAR Detection of 20- to 25-foot Boats
(32-nmi Range Scale; Wind Speed ≤ 8.0 knots)

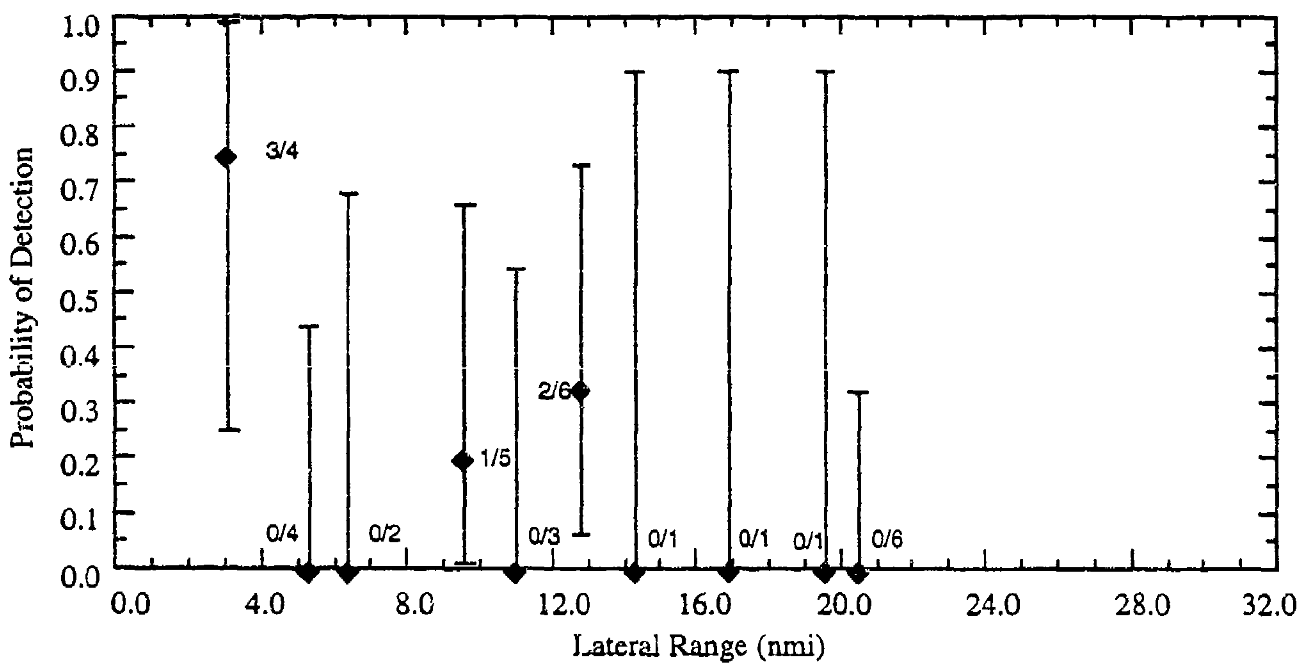

Figure 2-14. AN/APS-137 FLAR Detection of 20- to 25-foot Boats
(32-nmi Range Scale; Wind Speed = 8.1 to 15.2 knots)

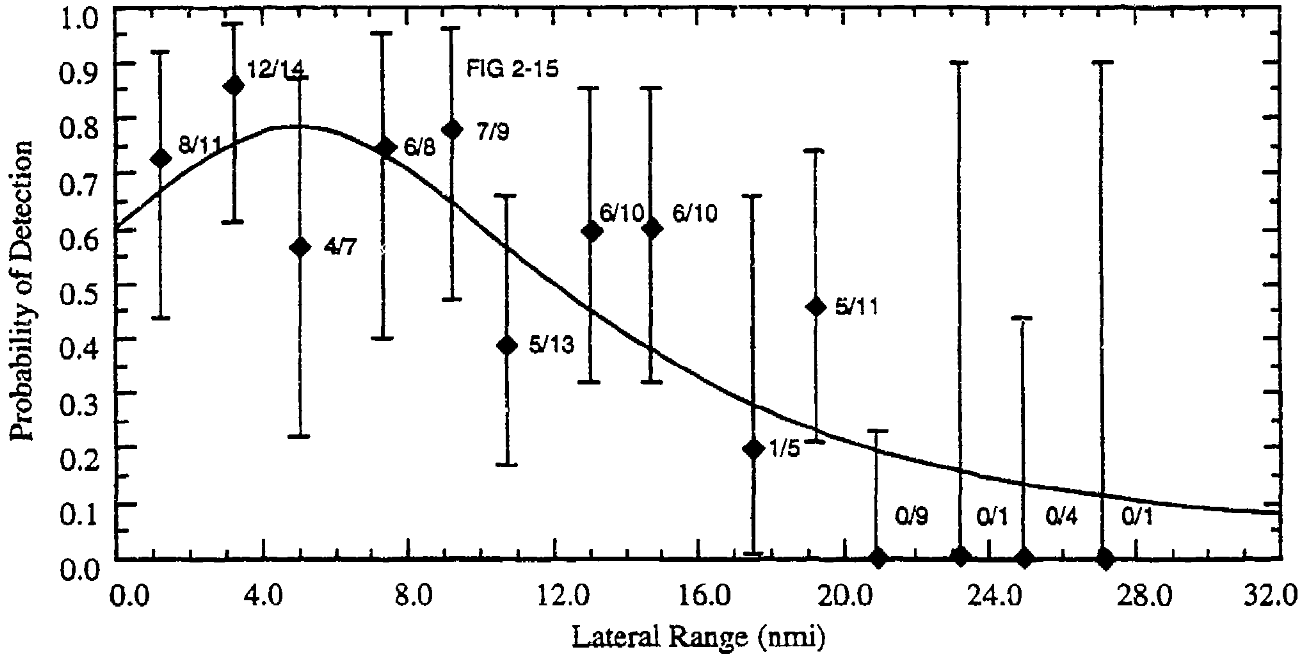

Figure 2-15. AN/APS-137 FLAR Detection of 26- to 35-foot Boats
(32-nmi Range Scale; Wind Speed ≤ 8.0 knots)

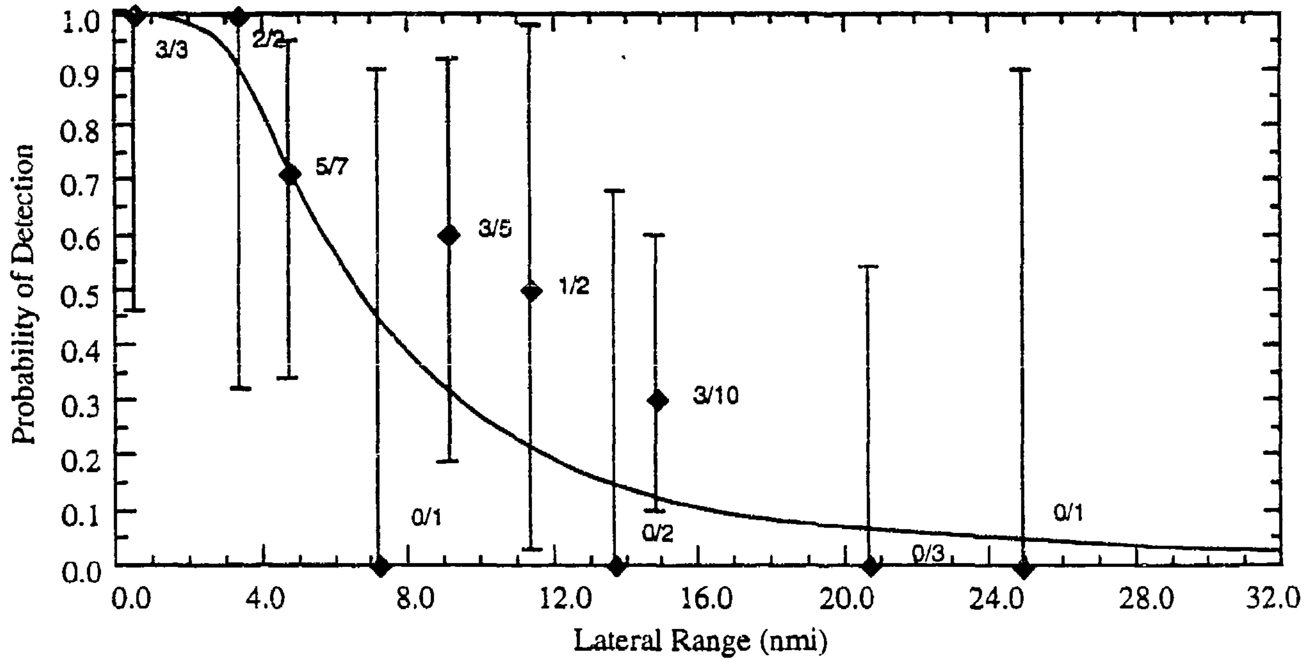

Figure 2-16. AN/APS-137 FLAR Detection of 26- to 35-foot Boats
(32-nmi Range Scale; Wind Speed = 8.1 to 15.2 knots)

Table 2-4. AN/APS-137 FLAR Detection Data for Small Boats for 16- and 32-nmi Range Scales

Range Scale (nmi)	Size (ft)	Wind speed (knots)	Number of Opportunities			Number of Detections			Sweep Width (nmi)
16	20 - 25	≤ 8	57	134	332	32	54	186	17.7
		8.1 to 15.2	77			22			8.4
	26 - 35	≤ 8	88	198		58	132		20.9
		8.1 to 15.2	110			74			17.2
32	20 - 25	≤ 8	70	103	252	23	29	106	15.4
		8.1 to 15.2	33			6			N/A
	26 - 35	≤ 8	113	149		60	77		25.6
		8.1 to 15.2	36			17			17.8

2.2.2.2 Comparison of Small Boat Detection Performance of the AN/APS-137 FLAR to the AN/APS-127 FLAR

Data from the Fall 1992 experiment were compared to the corresponding data for the AN/APS-127 FLAR (reference 8). To directly compare the two data sets, the AN/APS-137 FLAR data were separated into two data subsets: H_S less than or equal to 2 feet, and H_S between 2 and 3.6 feet. Small boat size was used to divide the H_S subsets into sizes from 20 to 30 feet and from 30 to 35 feet. For the purpose of comparison, the AN/APS-127 FLAR 20- and 40-nmi range scales were compared to the AN/APS-137 FLAR 16- and 32-nmi range scales, respectively. Figures 2-17 through figures 2-26 show the results of the comparison.

The AN/APS-137 FLAR performed comparable to or better than the AN/APS-127 FLAR. Table 2-5 lists the results of the sweep width analysis for both radars. Those data subsets that did not have sufficient data for a valid comparison of either radar are not shown. The radars performed equally well within the degree of uncertainty of the sweep width calculations for the following conditions:

- 16- and 20-nmi range scales; 20- to 30-foot boats; ≤ 2-foot seas, and

• 16- and 20-nmi range scales; 31- to 42-foot boats; 2.1- to 3.6-foot seas.

The AN/APS-137 FLAR performs considerably better than the AN/APS-127 FLAR against 20- to 30- foot small boat targets in higher seas. For the 16- and 20-nmi range scale, 23- to 30-foot boats in 2.1- to 3.6-foot seas, there is an approximate 100 percent improvement in performance as measured by sweep width. This is consistent with the improvements made in the radar to reduce high clutter and enhance weak target detections.

The sweep width comparison of the 16- and 32-nmi range scales must also account for the truncation of the detections when compared to 20- and 40-nmi range scales. Table 2-5 shows the sweep width values for the AN/APS-137 FLAR when using x_{max} (see section 1.4.2.5) as 20- and 40-nmi range scale instead of 16- and 32-nmi range scale, respectively. These calculations are shown only for comparison and should not be used for operational purposes.

Table 2-5. AN/APS-137 FLAR and the AN/APS-127 FLAR
Small Boat Sweep Width Values

Range Scale (nmi)	Small Boat Size (ft)	Significant Wave Height (ft)	AN/APS-137 Sweep Widths (nmi)	AN/APS-127 Sweep Widths (nmi)	Corrected * AN/APS-137 Sweep width
16/20	20-30	≤ 2	13.9	14.4	15.3
		2.1 to 3.6	14.1	7.3	14.9
	31-42	≤ 2	27.1	24.8	31.6
		2.1 to 3.6	15.9	16.5	17.4
32/40	20-30	2.0 to 3.6	16.1	15.4	16.5

* Presented only for comparison purposes and should not be used for operational use of the radar.

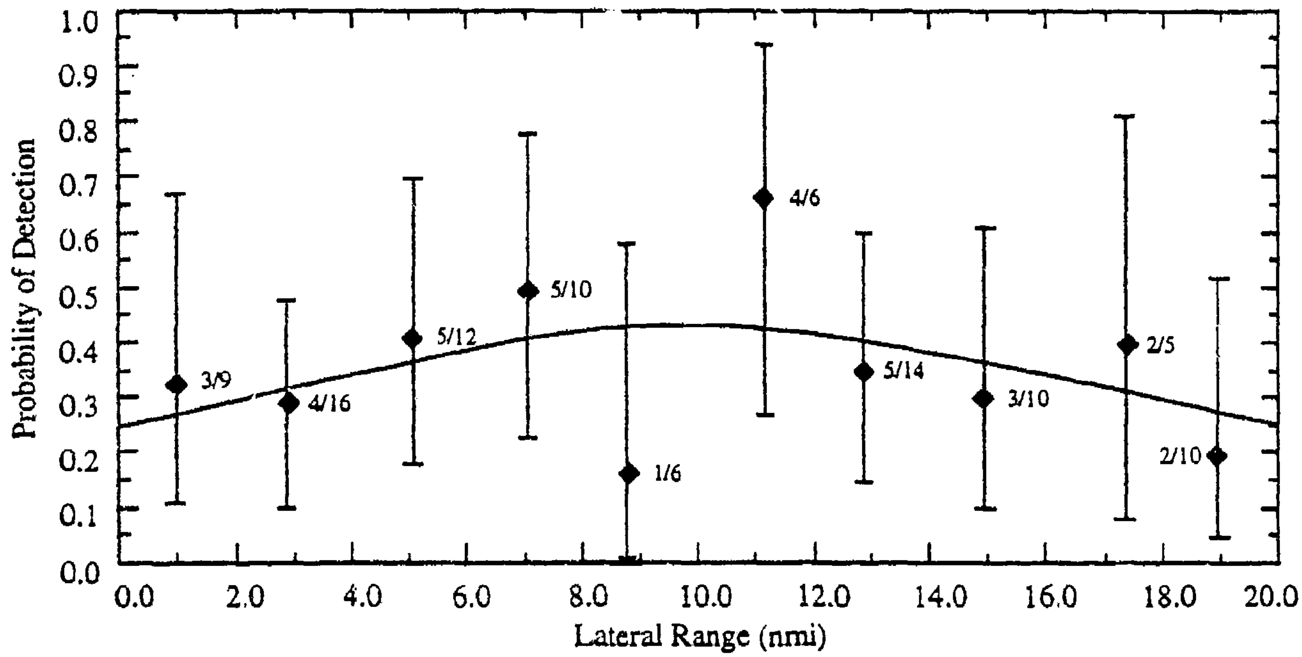

Figure 2-17. AN/APS-127 FLAR Detection of 23- to 30-foot Boats
(20-nmi Range Scale; $H_S \leq 2$ feet)

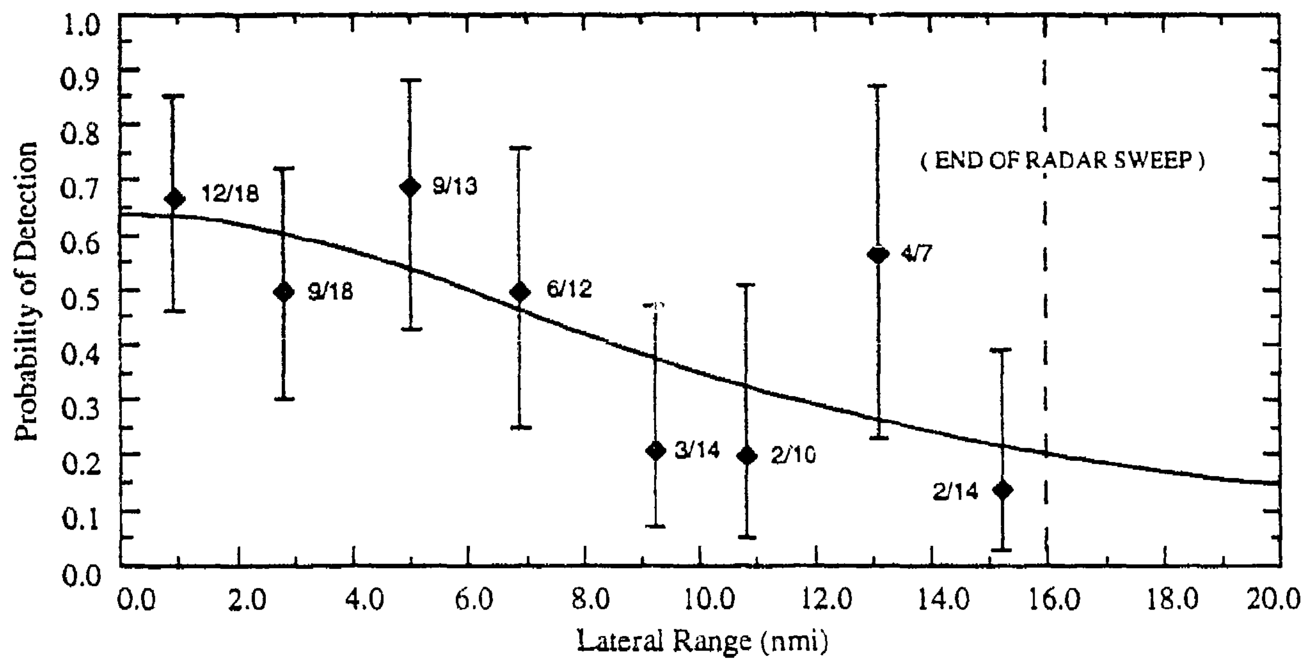

Figure 2-18. AN/APS-137 FLAR Detection of 20- to 30-foot Boats
(16-nmi Range Scale; $H_S \leq 2$ feet)

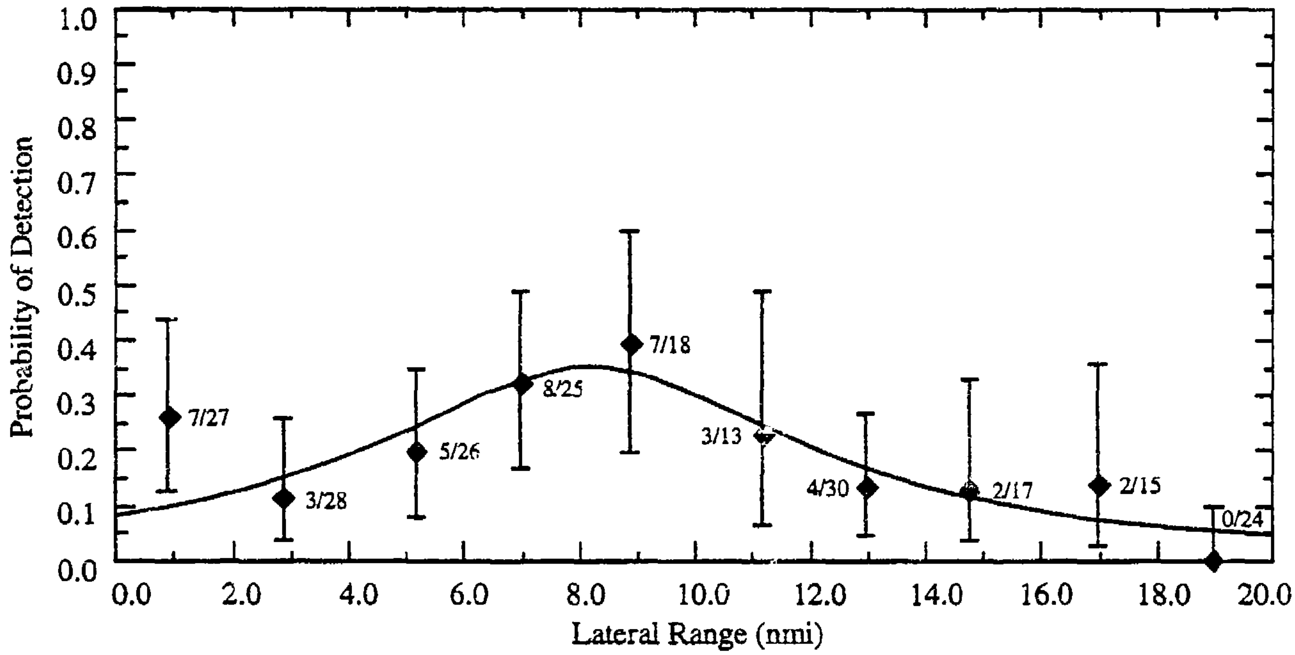

Figure 2-19. AN/APS-127 FLAR Detection of 23- to 30-foot Boats
(20-nmi Range Scale; H_S = 2.1 to 3.0 feet)

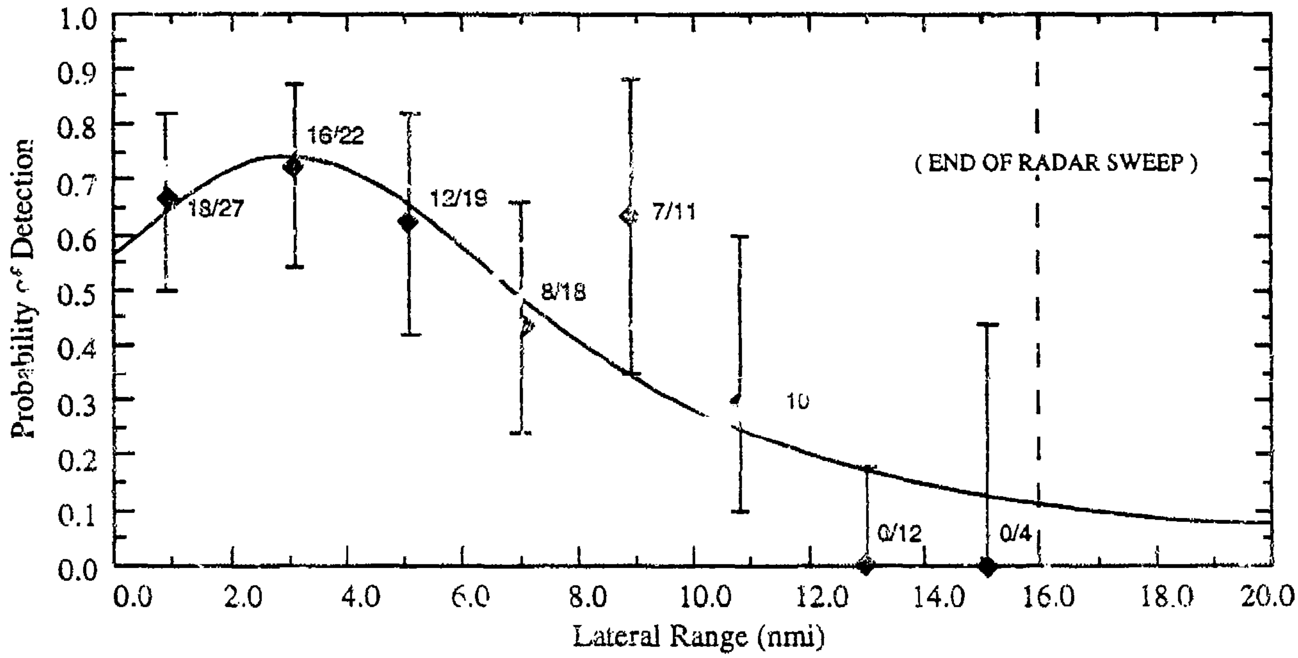

Figure 2-20. AN/APS-137 FLAR Detection of 20- to 30-foot Boats
(16-nmi Range Scale; H_S = 2.1 to 3.6 feet)

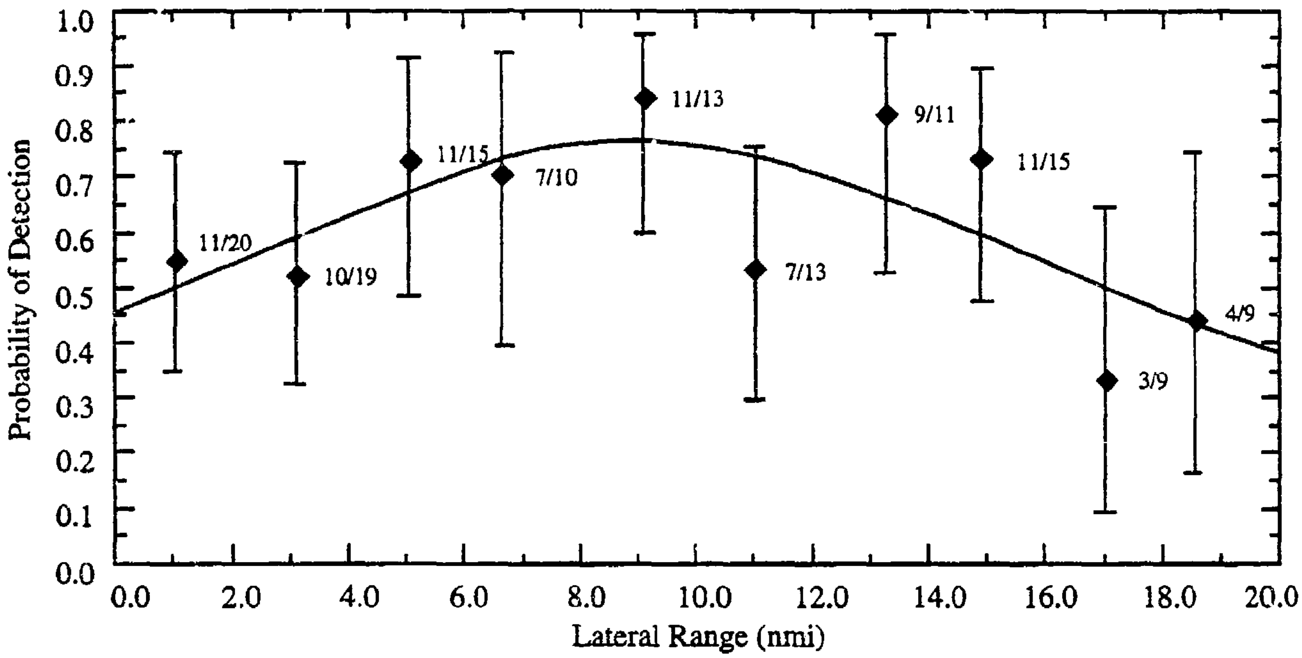

Figure 2-21. AN/APS-127 FLAR Detection of 32- to 42-foot Boats
(20-nmi Range Scale; $H_S \leq 2$ feet)

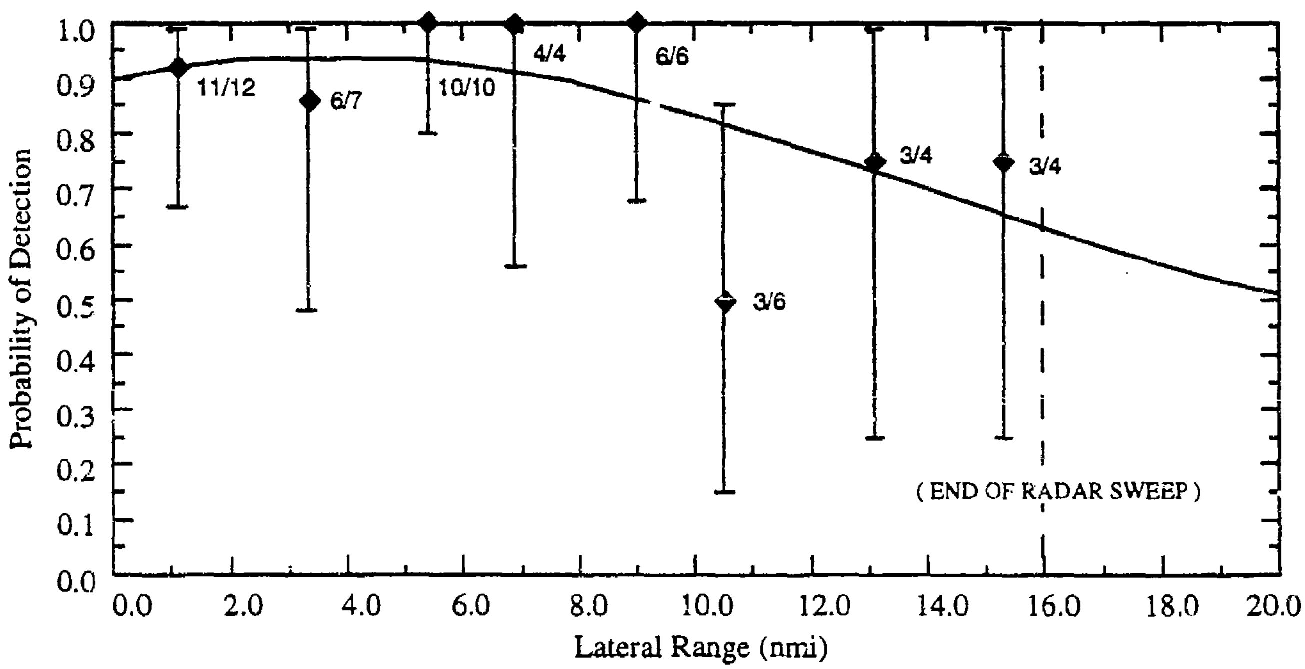

Figure 2-22. AN/APS-137 FLAR Detect n of 31- to 35-foot Boats
(16-nmi Range Scale; H ≤ 2 feet)

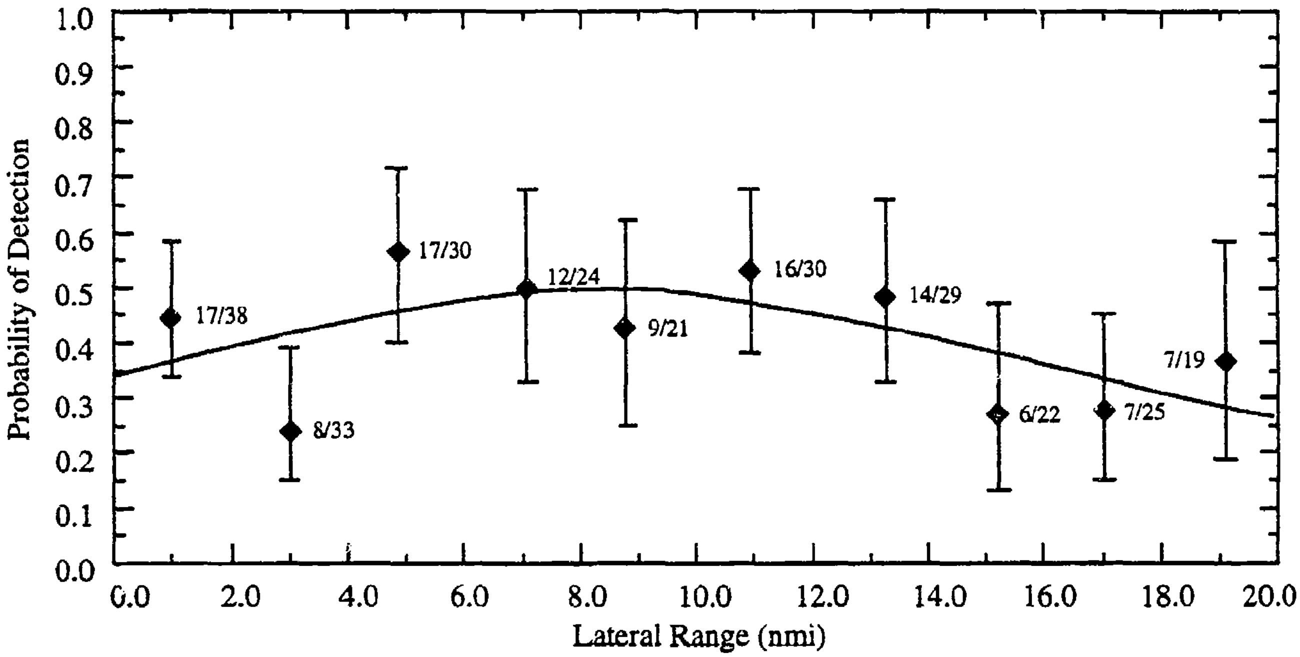

Figure 2-23. AN/APS-127 FLAR Detection of 32- to 42-foot Boats
(20-nmi Range Scale; H_S = 2.1 to 3.0 feet)

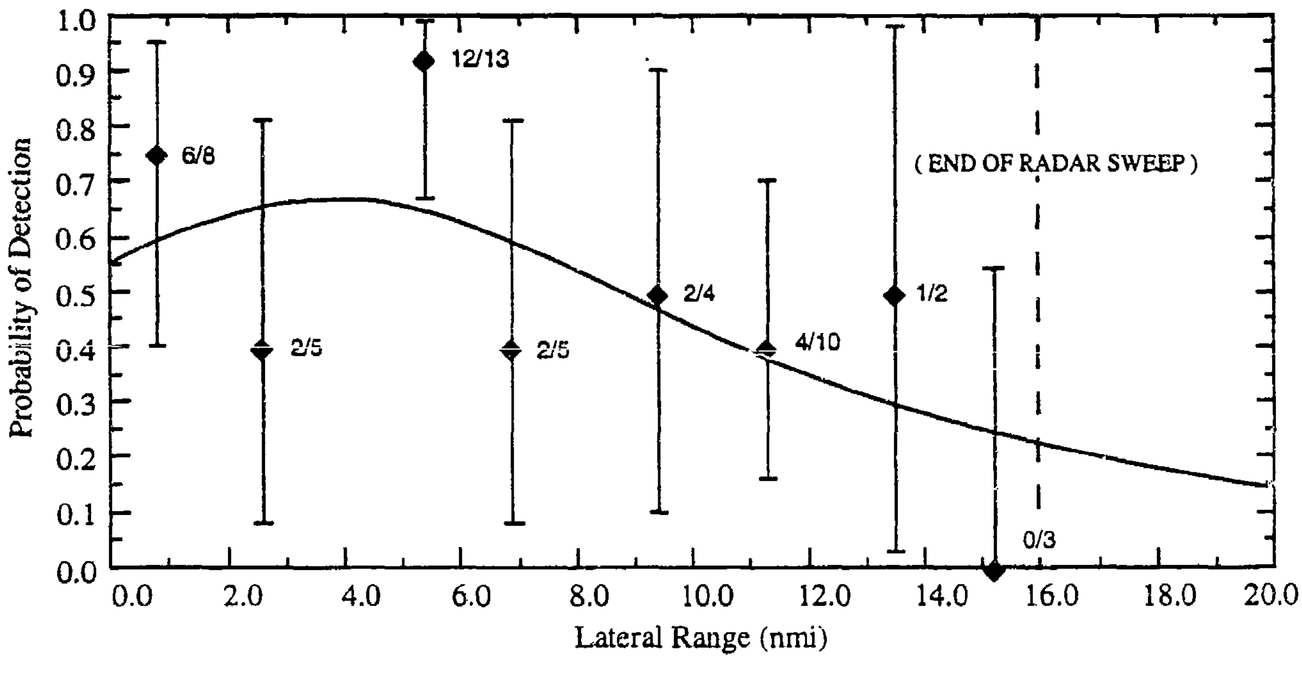

Figure 2-24. AN/APS-137 FLAR Detection of 31- to 35-foot Boats
(16-nmi Range Scale; H_S = 2.1 to 3.6 feet)

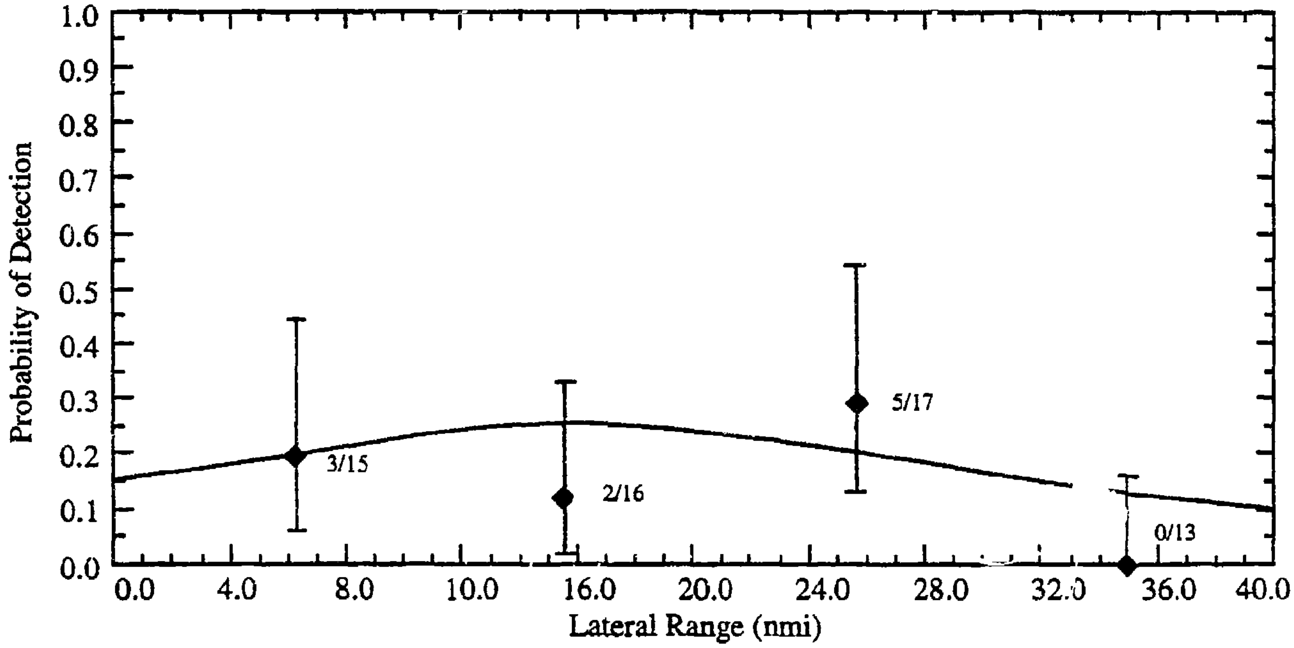

Figure 2-25. AN/APS-127 FLAR Detection of 23- to 30-foot Boats
(40-nmi Range Scale; H_S = 2.0 to 3.5 feet)

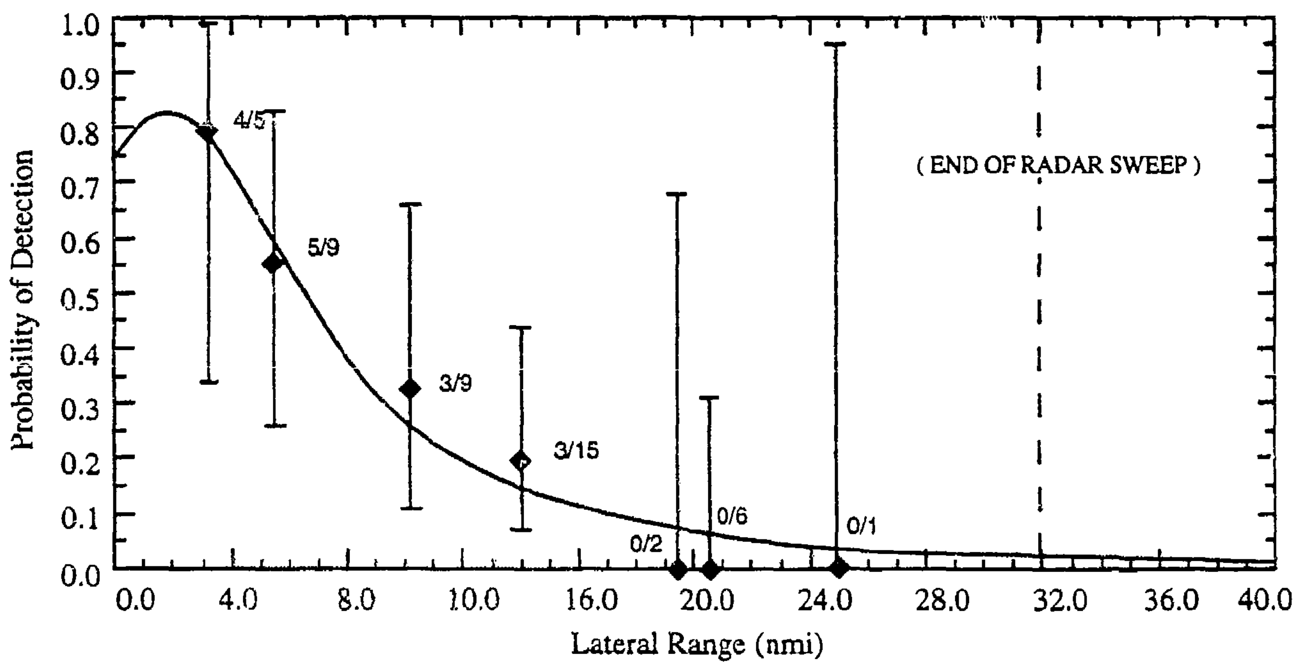

Figure 2-26. AN/APS-137 FLAR Detection of 20- to 30-foot Boats
(32-nmi Range Scale; H_S = 2.1 to 3.6 feet)

2.3 HUMAN FACTORS

The search parameters and general comments from the crew and the aircraft observer were analyzed for search conditions that significantly affect the operator's ability to detect a valid target. The search parameter that was analyzed for its direct effect on the operator was time-on-task.

2.3.1 Operator Performance

In the comparison of the AN/APS-127 FLAR detection performance with that of the AN/APS-137 FLAR the latter does not stand out as having a clear cut advantage. One would expect that the advantage of an advanced radar such as the AN/APS-137 FLAR would be most pronounced for weak targets (life rafts) and poor environmental conditions. The data in figures 2-5 through 2-26 do not document this advantage as strongly as expected. The conclusion was that detection of weak targets was operator limited and not radar limited. The radar operators appeared to have difficulty identifying weak targets and distinguishing those weak targets from environmental phenomena such as breaking waves. Operator detection difficulties could possibly be tied to the lack of "feedback" in the training process and during operations. Also the operator needs processing capabilities which discriminate and locate weak targets without interrupting the process of a search.

2.3.2 Detection Performance Versus Time-on-Task

The radar operator, during the Fall 1992, remained on the radar for the entire day, except for small breaks. The radar operators were relieved on a regular basis during the Spring 1992 experiment.

For the Spring 1992 data set, time-on-task correlated with several environmental factors and its effect on detection performance could not be effectively isolated. The data set could, however, be analyzed when used with the Fall 1992 data set for similar environmental conditions. Operators were rotated approximately every hour during the Spring 1992 experiment and they stood the full 5-hour watch during the Fall 1992 experiment. There was some degradation in performance between the first and third hours during the Fall 1992 experiment, while the Spring 1992 performance was fairly constant. This degradation could not be explained by changes in environmental conditions and is probably due to operator fatigue or boredom during the middle hours of a long radar watch. Rotation of the radar watchstander appears to reduce the fluctuations in performance that may occur during a long search.

2.3.3 Detection Performance Versus Relative Bearing

Figures 2-27 through 2-29 show the polar plots of the frequency of detection occurrence of life rafts and small boats versus the relative bearing from the aircraft. The data points are plotted with a cubic spline interpolation curve using detections in 30 degree windows. In figure 2-27, the plot shows that for rafts the highest proportion of detections occurred from 30 to 45 degrees either side of the nose of the aircraft. There is a slight decrease in the life-raft detection directly in front of the aircraft. This performance characteristic strongly agrees with the model of probability of detection based solely on integration time, or the amount of time that the target is on the screen.

The other lateral range curves had a less pronounced dip at smaller lateral ranges than that seen for life rafts. This corresponds to the increased detection performance for small boats at small relative bearings. Small boats provide a much stronger radar return than life rafts and would provide a positive signal-to-clutter ratio even within the clutter ring that occurs at approximately 3 nmi. Because the boat targets provide a better signal-to-noise (S/N) ratio they can be detected at longer ranges yielding smaller relative bearing angles for a given lateral range. Since life rafts have a lower S/N ratio they are more likely to be detected away from the nose of the aircraft and forward of the wing.

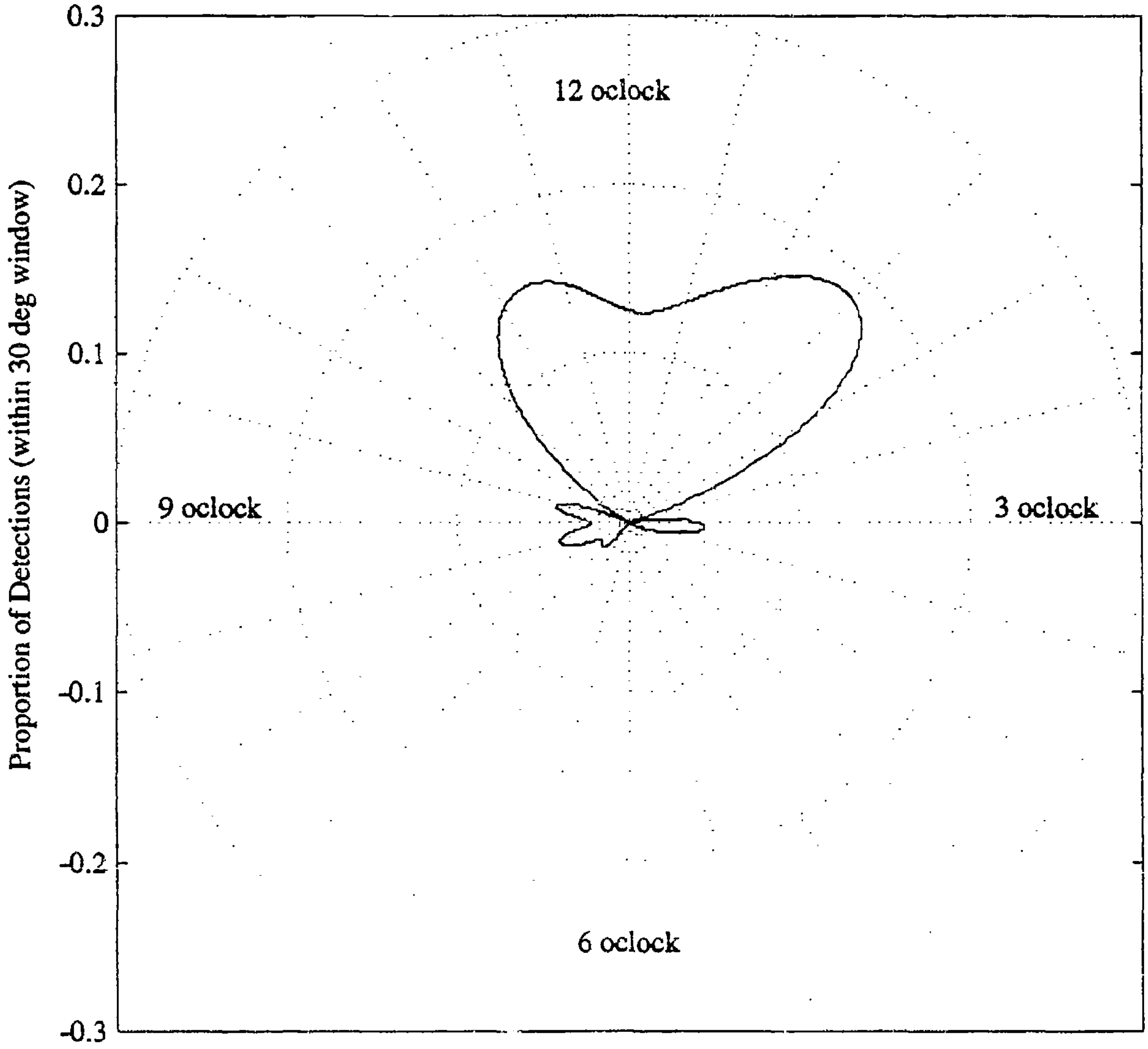

Figure 2-27. AN/APS-137 FLAR Life-Raft Detection Performance versus Relative Bearing (16-nmi Range Scale)

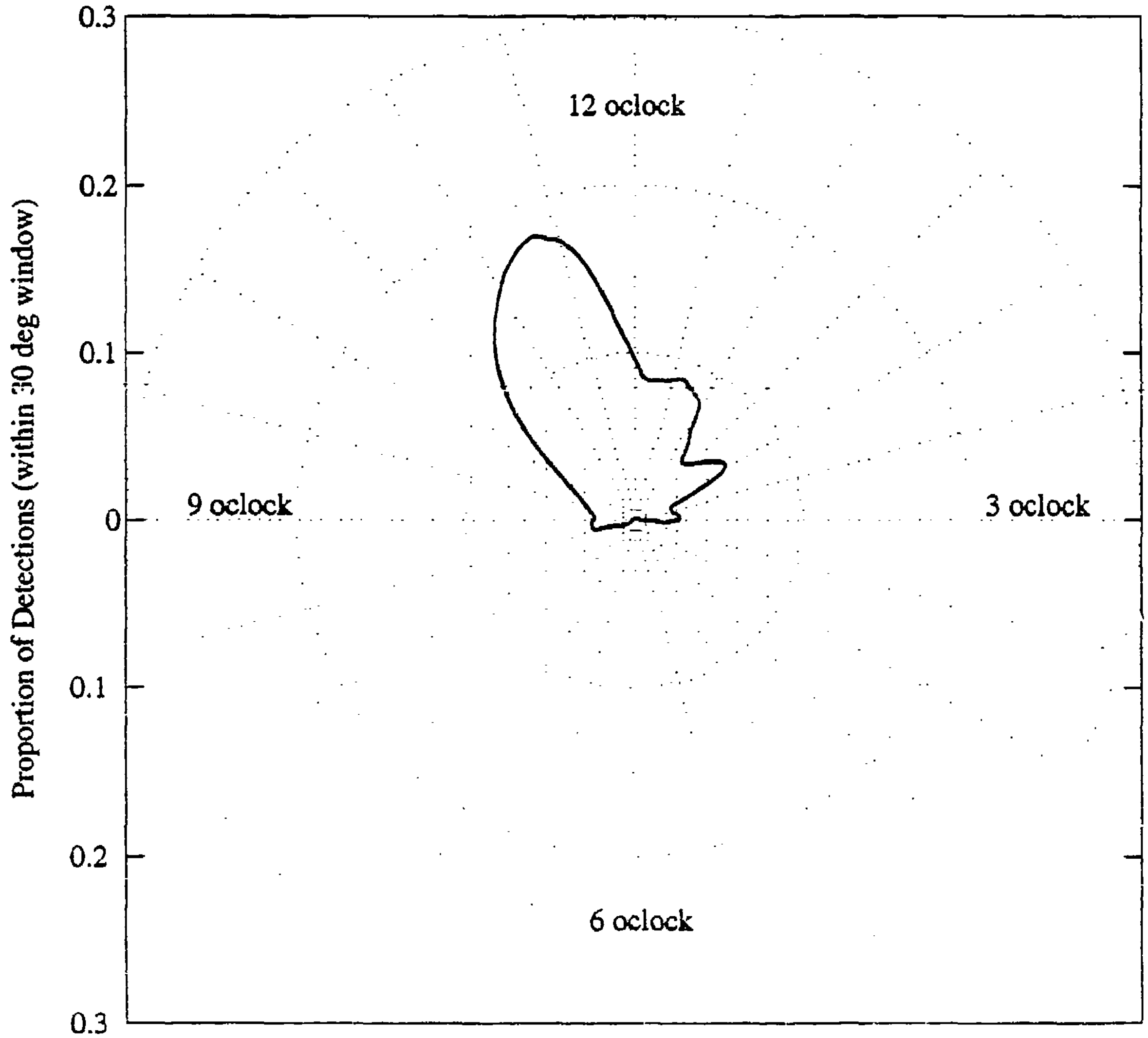

Figure 2-28. AN/APS-137 FLAR Small Boat Detection Performance versus Relative Bearing (16-nmi Range Scale)

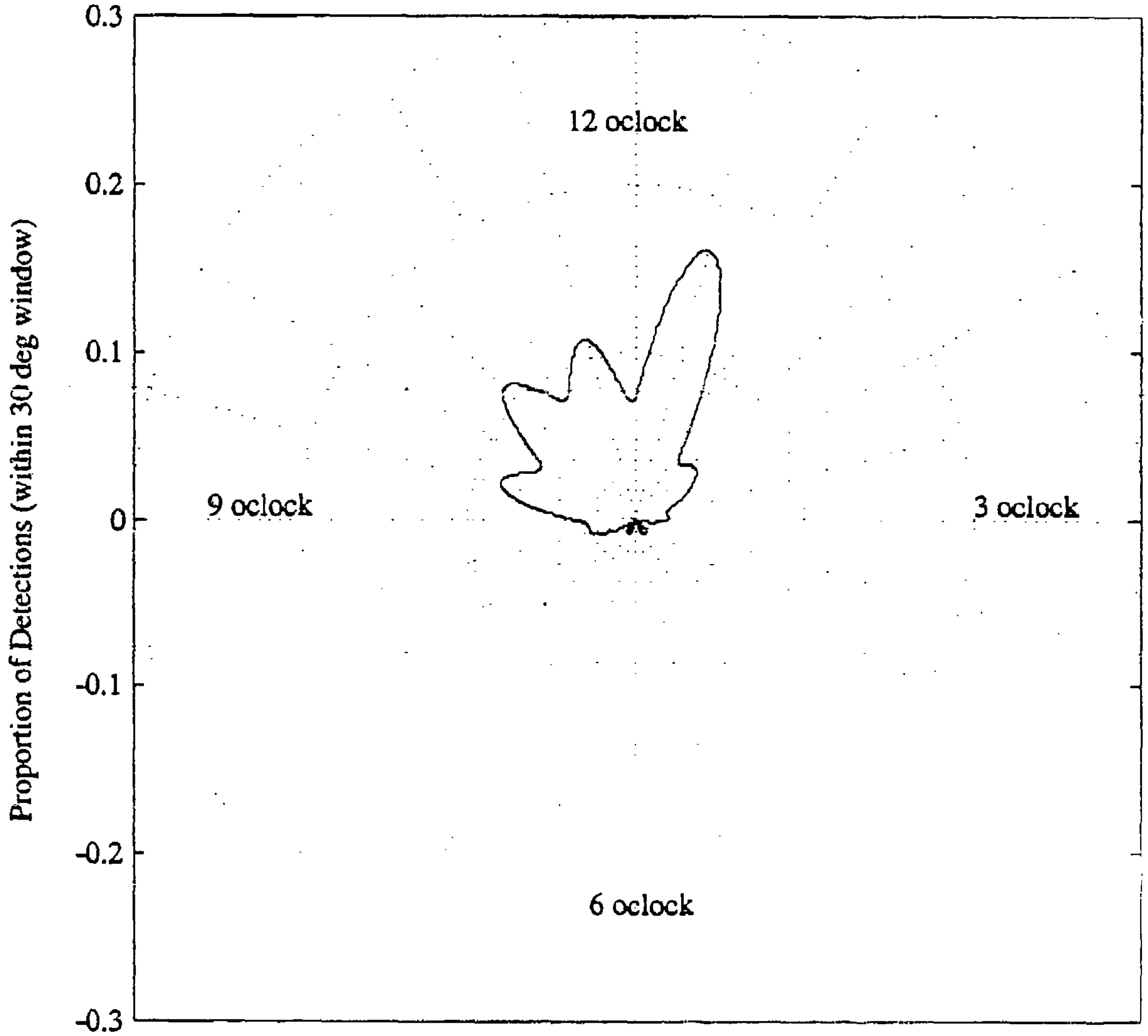

Figure 2-29. AN/APS-137 FLAR Small Boat Detection Performance versus Relative Bearing (32-nmi Range Scale)

2.3.4 Crew Comments

The following is a summary of comments from the Spring 1992 and Fall 1992 experiments made by the crew during the searches.

- 240 knots is too fast to do an effective search for small targets. A better speed is between 180 and 220 knots.

- Some operators thought they could see a raft out to about 4 nmi, others out to the end of the range scale.

- Each operator thought they needed to "warm up" on the way out to the search area by using visually identified targets of opportunity.

- Operators complained about losing contacts at about 5 nmi then regaining the same target again at about 1 nmi. They thought that having the radar in manual tilt control would solve this problem. (Manual tilt control would normally be used for investigating a specific target.)

- B-Scan works well in discriminating between a target and a sea return.

2.3.5 Data Recorder/Observer Comments

The following is a summary of the comments recorded by the experiment team personnel who were on the aircraft for the Spring and Fall searches.

- Faint or intermittent targets may have been missed in areas of heavy vessel traffic due to operator loading.

- To the observer, it appeared that the operators could not consistently identify vessel types by PPI display alone.

- Some radar operators did not understand why they should search further than the track spacing.

- The 14-inch display reduces much of the eyestrain that occurs with the 9-inch display.

- Radar operator procedures varied significantly from operator to operator. Search procedures and tagging procedures were largely based on personal preferences and, in some cases, may have been due to the operator's perception of his role in a experiment scenario rather than his role in a search. Variations included, but were not limited to, the following:

  - Use of B-Scan,
  - Use of BKGD or THRS mode (video process),
  - Auto or Manual Tilt Control,
  - Area (on the screen) or concentration of the search, and
  - Target-sea return discrimination.

2.3.6 Data Reconstruction Observations

The following is a summary of observations made during the data reconstruction.

- The INS error was not constant after a course change. If the INS error has a significant cross-track component, then it is possible that the distance between two successive legs could be significantly larger than the recommended value, resulting in a coverage factor of less than 1.0.

- Operators appeared to concentrate much of their search within about one track spacing distance from the aircraft.

- Weak contacts at very small CPAs were easily obscured by the aircraft heading cursor on the PPI display. At 200 knots, the heading cursor moves sufficiently fast enough across the screen so that the cursor quickly hides close CPA contacts. Also, the operators appeared to search away from the cursor, making detection of weak close aboard contacts less likely.

- Radar operators tended to wait to refresh the screen until approximately half the display was off the screen. This equates to about 2 minutes between each screen refresh. Additionally, it requires 5 to 10 seconds for each screen to be functional after a refresh. The absence of a large part of the display due to infrequent screen refreshes was responsible for several misses of weak targets with limited on-screen time.

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CHAPTER 3
CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

Based on the analyses in Chapter 2, the following conclusions are drawn concerning the AN/APS-137 FLAR performance.

3.1.1 AN/APS-137 FLAR Detection Performance for Life Rafts

1. The significant variables for AN/APS-137 FLAR detection performance for life-raft targets are:

- Radar range scale,
- Lateral range, and
- Wind speed.

Radar range scale was, by far, the dominant variable in determining Pdet in all sea conditions.

2. The life-raft detection data for the AN/APS-137 FLAR show a notable decrease in radar detection performance for wind speed conditions from 8.1 to 15.2 knots. The results agree with the expected decrease in signal-to-noise ratio due to the corresponding increase in wind driven waves that create much of the clutter on the screen.

3. The higher (32-nmi) range scale was significantly worse at detecting life-raft targets than the 16-nmi range scale for the same conditions. There were only 12 detections from 223 opportunities. This decrease in detection performance is most likely due to the degradation in display resolution from the 16-nmi range scale to the 32-nmi range scale.

4. The detection data were grouped by range scale and by using 2.0 feet as the H_S criteria to compare the AN/APS-137 FLAR performance to that of the AN/APS-127 FLAR. The AN/APS-137 FLAR performed at a level comparable to the AN/APS-127 FLAR for $H_S \leq 2$ feet, but performed appreciably better with H_S from 2.0 to 3.6 feet.

5. The AN/APS-127 FLAR performed better than the AN/APS-137 FLAR in the interval between 14 and 16 nmi due to the greater range scale for the AN/APS-127 FLAR (20 nmi versus 16 nmi).

6. Using standard radar search procedures, most of the raft detections were made between 30 and 45 degrees on either side of the aircraft heading. This result agreed with modeled results of detection versus target time within the radar range.

3.1.2 AN/APS-137 FLAR Detection Performance for Small Boats

1. The significant variables for AN/APS-137 FLAR detection performance for small-boat targets are:

- Lateral range,
- Range scale,
- Size, and
- Wind speed.

Lateral range was the dominant variable in determining Pdet.

2. There is a notable increase in detection of small boats greater than 25 feet. This may be due to the likelihood of boats larger than 25 feet having a flat deckhouse rather than a faired cabin. The deckhouse has a larger radar cross-section than the cabin providing a stronger return.

3. The AN/APS-137 FLAR is able to detect small boats beyond 16 nmi for H_S conditions up to 3.6 feet and wind speed up to 15.2 knots. There is still a greater-than-zero Pdet at the edge of the 16-nmi range scale, even for the higher H_S/wind speed conditions. There is a subtantial degradation in detection performance at shorter ranges when using the 32-nmi range scale.

4. The AN/APS-137 FLAR detection performance against 23- to 30-foot small boats is markedly improved over that of the AN/APS-127 FLAR for the 16-nmi range scale in higher sea conditions (2.1 to 3.6 feet). The performance of the AN/APS-137 FLAR is comparable or only marginally better than that of the AN/APS-127 FLAR for all other tested conditions.

5. From observing the radar operators and reviewing videotapes of the radar screen, the operators have some difficulty distinguishing a weak contact from a persistent sea return (such as from breaking waves).

6. The small boat detections were made primarily in front of the aircraft. The data set is small, however, and the performance versus relative bearing analysis cannot draw any definite conclusions. It appears that the small boat detections are not as dependent on position on the screen as the life-raft detections. This may be due to the larger amplitude radar echoes.

3.1.3 <u>General Conclusions</u>

1. The 14-inch Palletized Radar Operator's Station (PROS) display is an improvement over the previous 9-inch display. The display is easy to read and produces less eyestrain over a prolonged search.

2. Although there does not appear to be a standard screen refresh procedure, most operators, on the average, refresh the screen when approximately one-quarter of the range scale has gone off the display. The results of this can be seen, to some degree, when reviewing the distribution of range versus relative bearing of small boat and life-raft detections. This method may be better than using a standard refresh time interval. Radar operators are often too busy to keep track of the clock but can easily monitor the progress of the radar sweep across the display.

3. There does not appear to be an accepted criteria among the operators for using either the BKGD or THRS mode of the Video Process function. Though most operators typically use BKGD, some operators prefer to always use THRS, which could suppress weak signals.

4. The AN/APS-137 radar has a detection capability superior to that of the AN/APS-127 radar for weak targets, such as life rafts and the small boats under 30 feet, under adverse weather conditions. For the larger category of small boat targets there is no clear cut gain in performance using the AN/APS-137.

3.2 RECOMMENDATIONS

The following recommendations are made concerning airborne search planning using the AN/APS-137 FLAR.

3.2.1 AN/APS-137 FLAR Search for Life Rafts

1. The sweep widths provided in table 3-1 should be used for all AN/APS-137 FLAR searches for life rafts.

2. The 32-nmi range scale should never be used for life-raft searches. This range scale degrades detection performance at all lateral ranges, possibly due to the degradation in the screen resolution.

3. When the 16-nmi range scale is used to search for life rafts, there were enough life-raft targets detected from 8 to 12 nmi to preclude using the 8-nmi range scale even for higher wind speed and significant sea height conditions. The 16-nmi range scale allows for longer visual integration time and less required screen-refreshing than the 8-nmi range scale. The 16-nmi range scale should be used whenever searching for life rafts. The 8-nmi range scale should be used only to briefly to investigate a target.

4. The radar operator should turn the cursor off when searching for life-raft targets. The cursor provides an unwanted distraction that may also hide a weak, close aboard target.

Table 3-1. Sweep Widths for 4-, 6- and 10-Person Life Rafts Using the AN/APS-137 FLAR

Range Scale (nmi)	Wind Speed (knots)	Sweep Width (nmi)
16	1.0 to 8.0	8.8
	8.1 to 15.2	3.8

3.2.2 AN/APS-137 FLAR Search for Small Boats

1. The sweep widths provided in table 3-2 should be used for all AN/APS-137 FLAR searches for small boats from 20 to 35 feet in overall length.

2. The total detection performance, as reflected in the sweep width values, on the 32-nmi range scale was comparable to that on the 16-nmi range scale. The choice of range scales for small boat searches can be left to the operator. However, the use of the 32-nmi range scale has the advantage of greater target integration time.

3.2.3 General Recommendations

1. The AN/APS-137 FLAR operator should reposition the sweep origin periodically to maximize the on-screen time for weak or close aboard contacts. These contacts may only appear briefly before they are lost in the increasing clutter or in the fuselage shadow. Maximizing the uninterrupted time that the operator can observe the screen will improve the ability to detect these contacts. The operator, in ground stabilization mode, should not allow more than one quarter of the radar display range, directly in front of the aircraft, to go off the screen. When repositioning the sweep origin, the operator should not reposition the display so that more than one quarter of the radar display range, off the aircraft beam, is off the screen. Figure 3-1 illustrates the recommended limits.

Table 3-2. Sweep Widths for Small Boats (20 to 35 feet) Using the AN/APS-137 FLAR

Range Scale (nmi)	**Size (ft)**	**Windspeed (knots)**	**Sweep Width (nmi)**
16	20 – 25	≤ 8.0	17.7
		8.1 to 15.2	8.4
	26 to 35	≤8.0	20.9
		8.1 to 15.2	17.2
32	20 - 25	≤8.0	15.4
		8.1 to 15.2	N/A
	26 to 35	≤8.0	25.6
		8.1 to 15.2	17.8

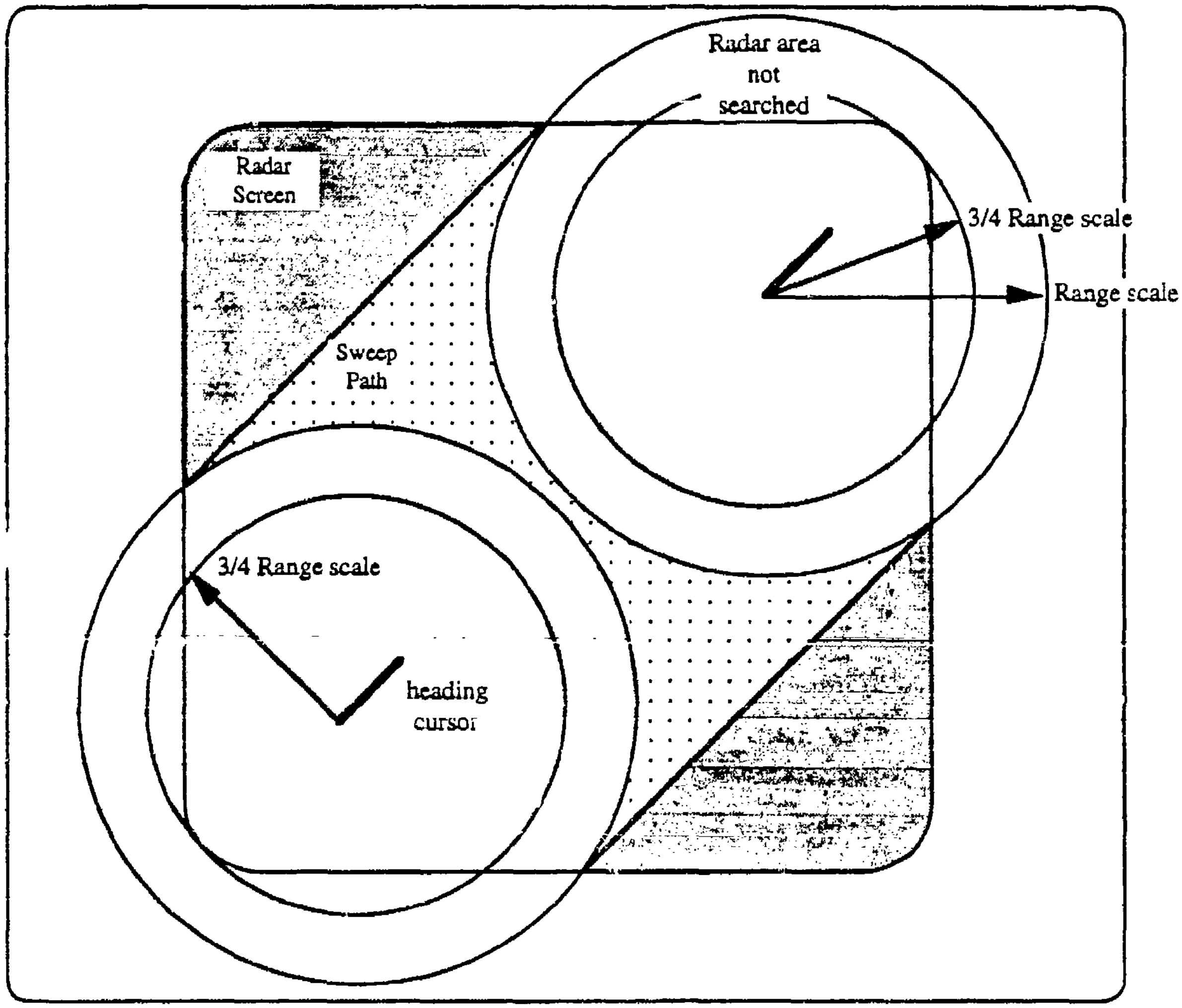

Figure 3-1. Example of Recommended Screen Positions for
AN/APS-137 FLAR GND Stabilized Display

2. Radar operators should not concentrate all of their efforts to within one track spacing but should always look out to the end of the recommended range scale for the following reasons:

- For weak targets, the lower surface backscatter at longer ranges may actually enhance detectability under certain environmental conditions,

- The overlapping of detection opportunities for multiple legs significantly increases the total Pdet, even for marginally detectable targets, and

- Environmental conditions that may cause shadow zones require that the radar operator search over the entire range scale along the search path of the SRU.

- Sweep width calculations are based on looking out to the edge of the range scale.

3. When conducting searches for weak or small targets, the operator should turn the heading cursor off or at least decrease the cursor brightness. Since a large portion of the detections are made in front of the aircraft, there is a good chance that leaving the cursor on may actually hide close aboard, weak contacts.

4. During a long search (> 5 hours), the operators may become bored in the beginning (1 to 2 hours) of the search, anticipating the long hours ahead. For long searches, rotate the operator after the first hour and then every one to two hours afterward.

5. Develop operator training exercises which use real identifiable targets in the life-raft and small boat categories to provide positive operator "feedback".

6. Equip Coast Guard search radars with weak target location and discrimination capabilities that assist the operator and which do not interrupt the search process.

3.2.4 Recommendations for Future Research

1. Future experiments should include data to determine the effects of altitude on detection performance under various environmental conditions. Lower altitude is expected to decrease the clutter at moderate ranges due to the lower radar grazing angle with the surface of the ocean.

2. Both low and high H_S data are needed to fully investigate the effects of significant wave height on detection performance. Significant wave height, along with wind speed, is needed to fully characterize the environment for a search.

3. The data collected for the AN/APS-137 FLAR does not contain sailboat data. In light of the data collected, the effects of the general low profile and tall mast structure of a typical sailboat cannot be predicted. Future experiments should include sailboats as targets.

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REFERENCES

1. "HC-130 ISAR System Operators Manual," Texas Instruments Publication HB29-DSEG88, Texas Instruments, Dallas, TX, 15 July 1988.

2. "HC-130 ISAR System Maintenance Manual," Texas Instruments Publication, Texas Instruments, Dallas, TX, 15 July 1988.

3. Raunig, D.L., AN/APS-137 Performance Analysis: Icebergs Life Rafts and Small Boats Targets, Quick Look Report, U.S. Coast Guard Research and Development Center and A&T Inc., 9 January 1992.

4. O'Brien, K.; Robe, R.Q.; and Raunig, D.L., AN/APS-137 Forward Looking Airborne Radar (FLAR) Evaluation Spring 1992 Experiment, Report N. CG-D-14-93, US Coast Guard Office of Engineering, Logistics, and Development, and A&T Inc., January 1993.

5. Koopman, B. G., Search and Screening, New York, Pergannon Press, 1980 , Chapter 3.

6. Cox, D. R., and E.J. Snell, Analysis of Binary Data, New York, Chapman and Hall, 1989, Appendix 2.

7. Hosmer, D., W. S. Lemeshow, Applied Logistic Regression Techniques, New York, Wiley-Interscience, 1989, Chapter 2.

8. Lewandowski, M.J.; Robe, R.Q.; Allen, A.A.; Reynolds W.H.; and Hover, G.L.; Exley, S.A.; Searle, H.S.; and Clark, P.V., Sweep Width Determination for HU-25B Airborne Radars: Life Raft and Recreational Boat Targets. Report No.CG-D-01-90, U.S. Coast Guard Office of Research and Development, Washington, DC, and A&T Inc., May 1989.

9. Apel, J. R., Principles of Ocean Physics, Orlando, FL, Academic Press, Inc., 1987, pp. 173-174.

10. Skolnik, Merrill, Radar Handbook, New York, McGraw-Hill, 1970, Chapter 26.

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APPENDIX A
SEARCH DATA

KEY TO DATA

This appendix contains the raw data files for the U.S. Coast Guard AN/APS-137 Forward Looking Airborne Radar experiment conducted in the spring and fall of 1992. Each data file is labeled with the date on which the data were collected.

The data files are listed in chronological order. Each file record represents one search unit/target interaction and describes the target detection opportunity using 14 parameters of interest. The following is a key to the format of each record.

Item 1:	DET	Detection? 1 = yes, 0 = no
Item 2:	TOT	Time on task (hours)
Item 3:	RNG	The aircraft reported range
~~Item 4:~~	~~LATRNG~~	~~Lateral range (nautical miles)~~
Item 5:	RNGSC	Range scale 8-,16- and 32-nautical miles
Item 6:	RBg	Relative Bearing of the target from the aircraft (degrees)
Item 7:	ALT	Aircraft altitude (feet)
Item 8:	WDSP	Wind speed (knots)
Item 9:	SWDIR	Relative wave direction 1 = looking into oncoming waves, 0 = looking across the direction of wave -1 = looking at the backside of the waves
Item 10:	HS	Significant wave height (feet)
Item 11:	PRECIP	Precipitation level 0 = none, 1 = light, 2 = moderate, 3 = heavy
Item 12:	WHCAPS	Whitecap coverage 0 = none, 1 = light, 2 = heavy
Item 13:	SIZE	The size of the target (feet) rafts = capacity boats = overall length
Item 14:	TGTREF	Type of target rafts = 0 rafts with reflector = 1 boats wood = 2 fiberglass = 3 metal = 4

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
1	0.5	9.9	9.9	16	092	1500	7.6	0	1.6	0	0	6	0
1	0.6	7.4	7.0	16	112	1500	7.6	1	1.6	0	0	10	0
1	0.7	6.0	1.5	16	345	1500	7.6	1	1.6	0	0	10	0
1	0.7	2.1	0.4	16	010	1500	7.6	-1	1.6	0	0	10	0
1	1.0	3.0	2.8	16	077	1500	6.0	0	3.0	0	0	10	0
1	1.2	4.1	1.1	16	016	1500	6.0	-1	3.0	0	0	6	0
1	1.3	7.1	6.9	16	079	1500	6.0	-1	3.0	0	0	10	0
1	1.4	0.7	0.2	16	000	1500	6.0	-1	3.0	0	0	4	0
1	1.5	3.8	3.8	16	080	1500	7.4	0	1.6	0	0	6	0
1	1.5	5.0	4.9	16	259	1500	6.0	0	3.0	0	0	6	0
1	1.8	5.4	0.1	16	003	1500	7.6	-1	1.6	0	0	6	0
1	1.9	3.1	3.0	16	230	1500	7.6	0	1.6	0	0	10	0
1	2.0	8.3	8.2	16	092	1500	7.6	0	1.6	0	0	6	0
1	2.1	7.1	6.2	16	310	1500	7.6	1	1.6	0	0	10	0
1	2.3	6.3	3.6	16	034	1500	5.2	-1	3.0	0	0	6	0
1	2.4	6.1	4.6	16	310	1500	5.2	1	3.0	0	0	6	0
1	2.4	6.0	2.0	16	020	1500	5.2	1	3.0	0	0	6	0
1	2.6	3.6	0.2	16	000	1500	5.2	1	3.0	0	0	6	0
1	2.7	11.2	9.2	16	056	1500	5.2	-1	3.0	0	0	41	3
1	2.7	2.9	2.8	16	243	1500	5.2	1	3.0	0	0	10	0
1	2.8	9.3	4.8	16	332	1500	5.2	0	3.0	0	0	6	0
1	2.9	9.3	8.9	16	104	1500	6.4	0	3.0	0	0	10	0
1	2.9	4.1	4.1	16	097	1500	6.4	0	3.0	0	0	10	0
1	3.0	3.6	3.6	16	095	1500	6.4	0	3.0	0	0	10	0
1	3.4	3.6	2.2	16	322	1500	7.0	-1	2.0	0	1	6	0
1	3.4	5.6	5.5	16	082	1500	7.0	0	2.0	0	1	10	0
1	3.5	12.4	9.9	16	307	1500	7.0	1	2.0	0	1	52	3
1	3.5	2.4	2.3	16	072	1500	7.0	0	2.0	0	1	10	0
1	3.5	2.0	0.1	16	000	1500	7.0	1	2.0	1	1	6	0
1	3.7	8.4	5.3	16	039	1500	7.6	1	3.0	0	0	6	0
1	3.8	7.5	2.7	16	016	1500	7.6	1	3.0	0	0	10	0
1	3.8	8.8	4.9	16	326	1500	7.6	1	3.0	0	0	37	4
1	3.9	5.3	0.9	16	009	1500	7.8	1	3.0	0	0	10	0
1	3.9	11.8	3.8	16	341	1500	7.8	0	2.6	0	0	10	0
1	3.9	9.6	9.0	16	290	1500	7.8	0	2.6	0	0	4	0
1	4.0	8.2	4.4	16	328	1500	7.8	0	2.6	0	0	41	3
1	4.0	3.1	3.0	16	284	1500	7.8	-1	2.6	0	0	6	0
1	4.0	7.6	7.5	16	098	1500	7.8	0	2.6	0	0	10	0
1	4.1	3.0	0.6	16	011	1500	7.8	0	2.6	0	0	41	3
1	4.1	2.0	1.5	16	133	1500	7.8	0	2.6	0	0	6	0
1	4.2	12.7	2.3	16	011	1500	7.8	-1	2.6	0	0	45	3
1	4.2	4.3	4.1	16	252	1500	7.8	1	2.6	0	0	4	0
1	4.3	10.9	0.1	16	002	1500	9.7	-1	2.6	0	0	37	4
1	4.6	9.1	2.2	16	014	1500	6.8	-1	1.6	0	0	10	0
1	4.7	7.6	3.7	16	029	1500	6.8	-1	1.6	0	0	52	3
1	4.7	5.0	5.0	16	268	1500	6.8	0	1.6	0	0	6	0
1	4.8	12.9	6.5	16	030	1500	6.8	-1	1.6	0	0	56	3
1	4.8	6.1	1.5	16	014	1500	7.2	1	1.6	0	0	52	3
1	5.1	5.2	4.7	16	064	1500	9.9	1	2.6	0	0	6	0
1	5.3	11.2	2.7	16	014	1500	9.9	1	2.6	0	0	45	3
1	5.3	8.2	0.1	16	000	1500	9.9	1	2.6	0	0	4	0

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
1	5.3	14.5	4.2	16	017	1500	8.6	1	2.6	0	0	41	3
1	1.2	6.1	6.1	16	087	1500	6.0	1	3.0	0	0	6	0
1	1.6	2.4	2.4	16	082	1500	6.0	0	3.0	0	0	6	0
1	2.2	6.2	5.5	16	063	1500	7.6	0	1.6	0	0	6	0
1	2.4	9.3	7.9	16	302	1500	5.2	1	3.0	0	0	10	0
1	2.8	13.4	12.4	16	068	1500	6.4	-1	3.0	0	0	45	3
1	3.3	15.4	14.8	16	073	1500	6.8	0	2.0	0	1	52	3
1	3.3	10.7	10.6	16	263	1500	6.8	0	2.0	0	1	6	0
1	3.9	14.1	6.4	16	333	1500	7.8	0	3.0	0	0	45	3
2	0.1	11.2	11.2	16	090	1500	4.9	-1	2.6	0	0	4	0
2	0.1	4.5	4.5	16	090	1500	4.9	-1	2.6	0	0	6	0
2	0.1	0.6	0.6	16	270	1500	4.9	1	2.6	0	0	6	0
2	0.1	15.1	15.1	16	090	1500	4.9	-1	2.6	0	0	6	0
2	0.2	10.3	10.3	16	090	1500	4.9	-1	2.6	0	0	4	0
2	0.3	4.9	4.9	16	090	1500	4.9	0	2.6	0	0	6	0
2	0.3	13.5	13.5	16	090	1500	4.9	0	2.6	0	0	6	0
2	0.3	2.9	2.9	16	090	1500	5.4	0	2.6	0	0	10	0
2	0.4	12.0	12.0	16	090	1500	5.4	0	2.6	0	0	6	0
2	0.6	5.3	5.3	16	090	1500	7.6	0	1.6	0	0	10	0
2	0.6	1.1	1.1	16	090	1500	7.6	0	1.6	0	0	10	0
2	0.7	4.2	4.2	16	090	1500	7.6	0	1.6	0	0	10	0
2	0.7	12.9	12.9	16	270	1500	7.6	0	1.6	0	0	6	0
2	0.8	4.2	4.2	16	270	1500	7.6	0	1.6	0	0	6	0
2	0.9	14.4	14.4	16	270	1500	6.0	0	3.0	0	0	6	0
2	1.0	6.1	6.1	16	270	1500	6.0	0	3.0	0	0	6	0
2	1.0	7.6	7.6	16	270	1500	6.0	0	3.0	0	0	6	0
2	1.0	14.1	14.1	16	270	1500	6.0	0	3.0	0	0	10	0
2	1.0	0.9	0.9	16	090	1500	6.0	0	3.0	0	0	6	0
2	1.1	4.6	4.6	16	270	1500	6.0	-1	3.0	0	0	4	0
2	1.2	9.4	9.4	16	270	1500	6.0	-1	3.0	0	0	6	0
2	1.2	11.8	11.8	16	270	1500	6.0	-1	3.0	0	0	10	0
2	1.2	5.8	5.8	16	270	1500	6.0	-1	3.0	0	0	4	0
2	1.3	1.0	1.0	16	090	1500	6.0	1	3.0	0	0	4	0
2	1.3	5.5	5.5	16	270	1500	6.0	-1	3.0	0	0	6	0
2	1.4	10.5	10.5	16	270	1500	6.0	-1	3.0	0	0	6	0
2	1.5	14.0	14.0	16	090	1500	6.0	0	3.0	0	0	10	0
2	1.5	10.2	10.2	16	090	1500	6.0	0	3.0	0	0	10	0
2	1.6	13.6	13.6	16	090	1500	6.0	0	3.0	0	0	10	0
2	1.6	6.8	6.8	16	270	1500	6.0	0	3.0	0	0	10	0
2	1.6	10.5	10.5	16	090	1500	6.0	0	3.0	0	0	6	0
2	1.9	11.6	11.6	16	090	1500	7.6	0	1.6	0	0	10	0
2	1.9	4.7	4.7	16	270	1500	7.6	0	1.6	0	0	10	0
2	1.9	15.6	15.6	16	090	1500	7.6	0	1.6	0	0	10	0
2	1.9	9.0	9.0	16	270	1500	7.6	0	1.6	0	0	10	0
2	2.1	8.4	8.4	16	090	1500	7.6	0	1.6	0	0	10	0
2	2.1	10.2	10.2	16	090	1500	7.6	0	1.6	0	0	10	0
2	2.2	11.0	11.0	16	2[illegible]	[illegible]00	7.6	0	1.6	0	0	6	0
2	2.4	12.8	12.8	16	090	1500	5.2	0	3.0	0	0	10	0
2	2.4	15.4	15.4	16	270	1500	5.2	0	3.0	0	0	6	0
2	2.4	15.5	15.5	16	270	1500	5.2	0	3.0	0	0	37	4
2	2.4	4.2	4.2	16	270	1500	5.2	0	3.0	0	0	10	0

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
2	2.4	10.8	10.8	16	090	1500	5.2	0	3.0	0	0	6	0
2	2.5	8.6	8.6	16	270	1500	5.2	0	3.0	0	0	10	0
2	2.5	5.1	5.1	16	090	1500	5.2	1	3.0	0	0	4	0
2	2.5	13.8	13.8	16	270	1500	5.2	-1	3.0	0	0	10	0
2	2.6	15.8	15.8	16	090	1500	5.2	1	3.0	0	0	6	0

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
1	0.1	18.3	14.4	16	051	1000	5.6	1	2.3	0	0	54	3
1	0.3	3.9	3.2	16	054	1000	8.0	1	2.3	0	0	10	0
1	0.3	6.1	1.2	16	349	1000	8.0	-1	2.3	0	0	10	0
1	0.6	11.7	11.1	16	097	1000	2.9	1	3.0	0	0	10	0
1	1.1	7.2	2.0	16	016	1000	7.4	0	2.3	0	0	10	0
1	1.5	3.9	2.6	16	041	1000	7.6	1	2.3	0	0	6	0
1	1.7	7.0	0.6	16	355	1000	7.6	0	2.3	0	0	6	0
1	1.8	7.6	0.9	16	353	1000	7.6	0	2.3	0	0	6	0
1	2.0	5.7	1.3	16	013	1000	7.0	-1	3.0	0	0	10	0
1	2.1	4.9	0.4	16	004	1000	7.0	-1	3.0	0	0	10	0
1	2.2	8.2	3.5	16	025	1000	4.7	0	3.0	0	0	10	0
1	2.7	0.7	0.3	16	024	1000	7.8	0	2.3	0	0	10	0
1	3.6	9.7	9.2	16	252	1000	6.4	0	3.0	0	0	56	3
1	3.7	15.9	15.8	16	276	1000	6.2	1	3.0	0	0	52	3
1	3.7	4.6	4.6	16	278	1000	6.2	1	3.0	0	0	10	0
1	4.0	11.1	5.0	16	333	1000	5.2	1	2.0	0	1	6	0
1	4.0	14.6	5.5	16	338	1000	5.2	1	2.0	0	1	54	3
1	4.0	3.5	3.5	16	085	1000	5.2	-1	2.0	0	1	6	0
1	4.2	5.0	0.6	16	353	1000	4.5	0	2.0	0	1	4	0
1	4.3	2.7	0.6	16	012	1000	4.5	0	2.0	0	1	4	0
1	4.3	7.6	3.2	16	335	1000	4.5	0	2.0	0	1	10	0
1	4.5	4.4	4.0	16	290	1000	4.5	-1	2.0	0	1	4	0
1	4.6	8.4	7.2	16	301	1000	4.5	-1	2.0	0	1	6	0
1	5.0	7.1	0.4	16	357	1000	3.7	-1	2.6	0	0	10	0
1	5.0	10.0	8.5	16	059	1000	3.7	0	2.6	0	0	10	0
1	5.0	8.9	5.5	16	322	1000	3.7	-1	2.6	0	0	10	0
1	5.2	4.6	4.3	16	110	1000	3.7	-1	2.6	0	0	10	0
1	5.2	3.9	3.2	16	055	1000	3.9	0	2.6	0	0	10	0
1	5.2	5.0	3.5	16	316	1000	3.9	1	2.6	0	0	6	0
1	4.0	11.7	4.4	16	338	1000	5.2	0	2.0	0	1	37	4
1	4.3	8.1	5.2	16	320	1000	4.5	0	2.0	0	1	41	3
2	0.1	13.2	13.2	16	090	1000	5.6	1	2.3	0	0	6	0
2	0.1	5.4	5.4	16	090	1000	5.6	1	2.3	0	0	10	0
2	0.1	1.1	1.1	16	270	1000	5.6	-1	2.3	0	0	10	0
2	0.2	10.0	10.0	16	090	1000	7.8	1	2.3	0	0	6	0
2	0.3	9.2	9.2	16	090	1000	7.8	1	2.3	0	0	6	0
2	0.6	5.0	5.0	16	090	1000	2.9	1	3.0	0	0	6	0
2	0.7	2.5	2.5	16	090	1000	5.6	1	3.0	0	0	10	0
2	0.7	9.8	9.8	16	270	1000	5.6	1	3.0	0	0	10	0
2	0.8	0.0	0.0	16	000	1000	5.6	0	3.0	0	0	6	0
2	0.8	6.2	6.2	16	270	1000	5.6	1	3.0	0	0	10	0
2	0.8	13.0	13.0	16	270	1000	5.6	1	3.0	0	0	6	0
2	1.1	4.2	4.2	16	270	1000	7.4	1	2.3	0	0	6	0
2	1.1	6.4	6.4	16	090	1000	7.4	-1	2.3	0	0	10	0
2	1.2	4.4	4.4	16	270	1000	7.6	1	2.3	0	0	6	0
2	1.2	8.8	8.8	16	270	1000	7.6	1	2.3	0	0	10	0
2	1.3	3.9	3.9	16	270	1000	7.6	1	2.3	0	0	10	0
2	1.3	6.9	6.9	16	090	1000	7.6	-1	2.3	0	0	10	0
2	1.3	0.5	0.5	16	090	1000	7.6	-1	2.3	0	0	10	0
2	1.3	7.5	7.5	16	270	1000	7.6	1	2.3	0	0	6	0
2	1.5	5.2	5.2	16	270	1000	7.6	-1	2.3	0	0	10	0

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
2	1.6	1.0	1.0	16	270	1000	7.6	-1	2.3	0	0	10	0
2	1.6	11.6	11.6	16	270	1000	7.6	-1	2.3	0	0	10	0
2	1.7	4.2	4.2	16	090	1000	7.6	1	2.3	0	0	10	0
2	1.7	7.0	7.0	16	270	1000	7.6	-1	2.3	0	0	10	0
2	1.7	11.2	11.2	16	270	1000	7.6	-1	2.3	0	0	10	0
2	1.7	5.6	5.6	16	090	1000	7.6	1	2.3	0	0	6	0
2	2.0	7.8	7.8	16	090	1000	7.0	1	3.0	0	0	6	0
2	2.1	4.8	4.8	16	270	1000	7.0	-1	3.0	0	0	6	0
2	2.1	14.0	14.0	16	090	1000	7.0	1	3.0	0	0	10	0
2	2.1	7.2	7.2	16	090	1000	7.0	1	3.0	0	0	10	0
2	2.2	12.0	12.0	16	090	1000	4.7	1	3.0	0	0	10	0
2	2.2	4.6	4.6	16	090	1000	4.7	-1	3.0	0	0	10	0
2	2.2	8.8	8.8	16	270	1000	4.7	1	3.0	0	0	10	0
2	2.2	14.2	14.2	16	270	1000	4.7	1	3.0	0	0	10	0
2	2.2	9.8	9.8	16	090	1000	4.7	-1	3.0	0	0	6	0
2	2.3	2.8	2.8	16	270	1000	4.7	1	3.0	0	0	6	0
2	2.5	6.1	6.1	16	090	1000	8.9	-1	2.3	0	0	6	0
2	2.6	0.1	0.1	16	270	1000	8.9	1	2.3	0	0	6	0
2	2.6	8.2	8.2	16	270	1000	8.9	1	2.3	0	0	6	0
2	2.6	15.8	15.8	16	270	1000	8.9	1	2.3	0	0	6	0
2	2.6	12.2	12.2	16	090	1000	8.9	-1	2.3	0	0	10	0
2	2.6	5.5	5.5	16	090	1000	8.9	-1	2.3	0	0	6	0
2	2.7	7.8	7.8	16	270	1000	7.8	1	2.3	0	0	10	0
2	2.7	6.0	6.0	16	090	1000	7.8	-1	2.3	0	0	10	0
2	2.8	8.1	8.1	16	270	1000	7.8	1	2.3	0	0	45	3
2	2.8	1.2	1.2	16	090	1000	7.8	-1	2.3	0	0	6	0
2	2.8	9.9	9.9	16	090	1000	7.8	-1	2.3	0	0	10	0
2	2.8	2.2	2.2	16	090	1000	7.8	-1	2.3	0	0	6	0
2	2.8	11.7	11.7	16	270	1000	7.8	1	2.3	0	0	4	0
2	2.8	2.1	2.1	16	270	1000	7.8	1	2.3	0	0	4	0
2	3.6	0.7	0.7	16	090	1000	6.4	0	3.0	0	0	10	0
2	3.7	13.5	13.5	16	270	1000	6.2	0	3.0	0	0	10	0
2	3.7	13.3	13.3	16	090	1000	6.2	0	3.0	0	0	10	0
2	3.7	6.6	6.6	16	090	1000	6.2	-1	3.0	0	0	6	0
2	4.0	11.6	11.6	16	090	1000	5.2	-1	2.0	0	1	6	0
2	4.1	5.5	5.5	16	270	1000	5.2	1	2.0	0	1	4	0
2	4.2	4.6	4.6	16	090	1000	5.2	-1	2.0	0	1	10	0
2	4.2	13.4	13.4	16	090	1000	5.2	-1	2.0	0	1	10	0
2	4.3	13.8	13.8	16	090	1000	4.5	-1	2.0	0	1	6	0
2	4.3	14.5	14.5	16	090	1000	4.5	-1	2.0	0	1	6	0
2	4.3	10.5	10.5	16	090	1000	4.5	-1	2.0	0	1	4	0
2	4.4	15.2	15.2	16	270	1000	4.5	-1	2.0	0	1	4	0
2	4.4	5.5	5.5	16	270	1000	4.5	-1	2.0	0	1	4	0
2	4.6	8.5	8.5	16	270	1000	4.5	-1	2.0	0	1	10	0
2	4.6	1.7	1.7	16	090	1000	4.5	1	2.0	0	1	4	0
2	4.6	0.9	0.9	16	090	1000	4.5	1	2.0	0	1	54	3
2	4.7	0.6	0.6	16	090	1000	4.7	1	2.0	0	1	6	0
2	4.7	15.2	15.2	16	270	1000	4.7	-1	2.0	0	1	6	0
2	4.7	0.8	0.8	16	090	1000	4.7	1	2.0	0	1	37	4
2	5.0	11.2	11.2	16	270	1000	3.7	-1	2.6	0	0	6	0
2	5.0	11.1	11.1	16	090	1000	3.7	1	2.6	0	0	52	3

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DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
2	5.1	1.7	1.7	16	090	1000	3.7	0	2.6	0	0	6	0
2	5.1	6.6	6.6	16	270	1000	3.7	0	2.6	0	0	10	0
2	5.1	6.5	6.5	16	090	1000	3.7	0	2.6	0	0	6	0
2	5.1	11.4	11.4	16	090	1000	3.7	0	2.6	0	0	10	0
2	5.2	9.4	9.4	16	270	1000	3.9	1	2.6	0	0	10	0
2	5.2	14.5	14.5	16	270	1000	3.9	1	2.6	0	0	10	0
2	5.2	9.5	9.5	16	090	1000	3.9	-1	2.6	0	0	6	0
2	5.2	3.6	3.6	16	090	1000	3.9	-1	2.6	0	0	10	0
2	5.3	3.2	3.2	16	270	1000	3.9	1	2.6	0	0	6	0
2	0.7	2.6	2.6	16	090	1000	5.6	-1	3.0	0	0	10	0
2	0.7	4.8	4.8	16	270	1000	5.6	1	3.0	0	0	10	0
2	3.6	6.0	6.0	16	270	1000	6.4	1	3.0	0	0	6	0

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
1	0.0	7.6	5.4	32	044	1500	13	-1	3.0	0	1	10	0
1	0.1	6.7	6.6	32	079	1500	13	0	3.0	0	0	10	0
1	0.2	16.0	12.6	32	052	1500	13	-1	3.0	0	1	37	4
1	0.2	1.8	1.8	32	090	1500	13	0	3.0	0	1	10	0
1	0.6	8.2	7.7	16	077	1500	12	-1	3.6	1	1	10	0
1	1.0	10.3	6.8	16	318	1500	10	0	3.0	0	1	6	0
1	1.2	7.6	0.4	16	002	1500	10	0	3.0	0	1	10	0
1	1.5	5.8	5.6	16	072	1500	10	0	3.0	0	0	6	0
1	1.6	9.0	1.5	16	014	1500	10	0	3.0	0	1	6	0
1	1.9	10.5	9.7	16	065	1500	7	0	3.6	0	1	6	0
1	3.3	13.1	1.1	16	355	1500	6	0	3.3	1	0	6	0
1	3.3	4.6	1.7	16	023	1500	6	0	3.3	1	0	10	0
1	3.3	10.0	9.5	16	073	1500	6	0	3.3	1	0	6	0
1	3.8	6.0	3.9	16	317	1500	9	0	3.0	1	1	37	4
1	3.9	13.2	3.0	16	345	1500	9	0	3.0	0	0	45	3
1	4.0	9.4	3.8	16	335	1500	9	0	3.0	0	1	41	3
1	4.3	11.0	4.0	16	019	1500	9	-1	3.0	0	0	6	0
1	4.3	6.0	5.7	16	291	1500	8	0	3.0	0	0	10	0
1	4.4	14.1	10.0	16	314	1500	8	0	3.0	0	1	10	0
1	4.4	3.1	2.4	16	051	1500	8	-1	3.0	0	1	4	0
1	4.4	5.1	0.0	16	000	1500	8	0	3.0	0	1	6	0
1	4.4	12.6	5.8	16	023	1500	8	-1	3.0	0	0	6	0
1	4.5	9.3	8.8	16	288	1500	8	0	3.0	0	0	10	0
1	4.7	11.2	1.3	16	351	1500	5	0	3.0	1	0	10	0
1	4.8	9.3	9.2	16	077	1500	5	0	3.0	1	0	10	0
2	0.1	0.4	0.4	16	270	1500	13	0	3.0	0	1	10	0
2	0.1	0.6	0.6	16	270	1500	13	0	3.0	0	0	10	0
2	0.1	15.9	15.9	16	090	1500	13	0	3.0	0	0	6	0
2	0.2	13.8	13.8	16	090	1500	13	0	3.0	0	1	4	0
2	0.2	11.2	11.2	16	090	1500	13	0	3.0	0	1	6	0
2	0.3	5.7	5.7	16	090	1500	12	0	3.0	1	1	6	0
2	0.3	1.4	1.4	16	090	1500	12	0	3.0	1	1	10	0
2	0.5	0.7	0.7	16	270	1500	12	1	3.6	1	1	10	0
2	0.5	9.4	9.4	16	090	1500	12	-1	3.6	1	1	10	0
2	0.7	3.7	3.7	16	270	1500	12	-1	3.6	1	1	10	0
2	0.7	15.3	15.3	16	270	1500	12	-1	3.6	1	1	6	0
2	0.8	4.7	4.7	16	270	1500	12	-1	3.6	1	1	10	0
2	0.8	5.2	5.2	16	090	1500	12	1	3.6	1	1	10	0
2	0.9	3.6	3.6	16	090	1500	10	0	3.0	1	1	10	0
2	1.0	0.8	0.8	16	270	1500	10	0	3.0	1	1	6	0
2	1.0	10.9	10.9	16	270	1500	10	0	3.0	1	1	6	0
2	1.0	3.8	3.8	16	090	1500	10	0	3.0	0	1	10	0
2	1.1	8.3	8.3	16	270	1500	10	0	3.0	0	1	4	0
2	1.1	15.6	15.6	16	270	1500	10	0	3.0	0	1	37	4
2	1.2	6.2	6.2	16	090	1500	10	0	3.0	0	0	10	0
2	1.2	0.7	0.7	16	270	1500	10	0	3.0	0	0	10	0
2	1.2	10.4	10.4	16	270	1500	10	0	3.0	0	0	6	0
2	1.2	12.0	12.0	16	270	1500	10	0	3.0	0	1	4	0
2	1.3	5.7	5.7	16	090	1500	10	0	3.0	0	1	10	0
2	1.4	10.7	10.7	16	270	1500	10	0	3.0	0	1	10	0
2	1.4	5.1	5.1	16	270	1500	10	0	3.0	0	1	10	0

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
2	1.4	7.0	7.0	16	090	1500	10	0	3.0	0	1	4	0
2	1.4	13.3	13.3	16	090	1500	10	0	3.0	0	1	6	0
2	1.5	10.9	10.9	16	270	1500	10	0	3.0	0	0	10	0
2	1.5	4.1	4.1	16	270	1500	10	0	3.0	0	0	10	0
2	1.5	11.0	11.0	16	090	1500	10	0	3.0	0	0	4	0
2	1.6	8.5	8.5	16	270	1500	10	0	3.0	0	1	10	0
2	1.6	3.8	3.8	16	090	1500	10	0	3.0	0	1	4	0
2	1.6	13.6	13.6	16	090	1500	10	0	3.0	0	1	10	0
2	1.7	8.0	8.0	16	270	1500	10	0	3.0	1	1	10	0
2	1.6	3.8	3.8	16	270	1500	10	0	3.0	1	1	6	0
2	1.6	6.4	6.4	16	090	1500	10	0	3.0	1	1	6	0
2	1.6	12.0	12.0	16	090	1500	10	0	3.0	1	1	6	0
2	1.9	10.9	10.9	16	270	1500	7	1	3.6	1	1	10	0
2	1.9	0.8	0.8	16	270	1500	7	1	3.6	1	1	10	0
2	1.9	12.5	12.5	16	090	1500	7	-1	3.6	1	1	10	0
2	2.0	2.0	2.0	16	270	1500	7	1	3.6	0	0	10	0
2	2.1	15.5	15.5	16	270	1500	7	-1	3.6	0	0	6	0
2	2.1	5.6	5.6	16	090	1500	7	-1	3.6	0	0	10	0
2	2.1	5.0	5.0	16	090	1500	7	-1	3.6	0	0	10	0
2	2.1	7.8	7.8	16	270	1500	7	-1	3.6	0	0	10	0
2	2.1	15.5	15.5	16	270	1500	7	-1	3.6	0	0	6	0
2	2.3	13.9	13.9	16	090	1500	7	0	2.6	0	1	10	0
2	2.4	9.8	9.8	16	090	1500	7	0	2.6	0	1	6	0
2	2.4	0.7	0.7	16	270	1500	7	0	2.6	0	1	6	0
1	2.4	7.0	6.2	16	289	1500	7	0	2.6	0	1	6	0
2	2.4	14.6	14.6	16	090	1500	7	0	2.6	0	1	10	0
2	2.4	7.7	7.7	16	270	1500	7	0	2.6	0	1	10	0
2	2.5	1.9	1.9	16	090	1500	7	0	2.6	0	1	4	0
2	2.4	13.0	13.0	16	270	1500	7	0	2.6	0	1	6	0
2	2.4	13.2	13.2	16	270	1500	7	0	2.6	0	1	37	4
2	2.6	15.8	15.8	16	090	1500	7	0	2.6	0	0	10	0
2	2.6	9.0	9.0	16	090	1500	7	0	2.6	0	0	10	0
2	2.6	0.7	0.7	16	270	1500	7	0	2.6	0	0	6	0
2	2.6	6.1	6.1	16	270	1500	7	0	2.6	0	0	4	0
2	2.6	12.9	12.9	16	270	1500	7	0	2.6	0	0	6	0
2	2.6	2.6	2.6	16	270	1500	7	0	2.6	0	1	4	0
2	2.6	8.9	8.9	16	270	1500	7	0	2.6	0	1	6	0
2	2.7	15.1	15.1	16	090	1500	7	0	2.6	0	1	10	0
2	2.7	9.7	9.7	16	090	1500	7	0	2.6	0	1	10	0
2	2.7	14.2	14.2	16	270	1500	7	0	2.6	0	1	4	0
2	2.7	15.9	15.9	16	270	1500	7	0	2.6	0	1	41	3
2	3.3	11.4	11.4	16	090	1500	6	-1	3.3	1	0	10	0
2	3.8	5.4	5.4	16	270	1500	8	0	3.0	0	0	6	0
2	3.8	10.1	10.1	16	090	1500	9	0	3.0	0	0	6	0
2	3.8	4.3	4.3	16	090	1500	9	0	3.0	0	0	6	0
2	3.7	7.4	7.4	16	270	1500	8	0	3.0	0	0	54	3
2	3.8	15.0	15.0	16	090	1500	9	0	3.0	1	1	6	0
2	3.8	2.7	2.7	16	090	1500	9	0	3.0	1	1	10	0
2	3.8	2.4	2.4	16	270	1500	9	0	3.0	1	1	6	0
2	3.8	12.6	12.6	16	090	1500	9	0	3.0	1	1	4	0
2	3.9	10.8	10.8	16	090	1500	9	0	3.0	0	0	6	0

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DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
2	3.9	5.6	5.6	16	090	1500	9	0	3.0	0	0	4	0
2	3.9	1.3	1.3	16	270	1500	9	0	3.0	0	0	6	0
2	4.0	9.7	9.7	16	090	1500	9	0	3.0	0	1	4	0
2	4.0	3.4	3.4	16	090	1500	9	0	3.0	0	1	6	0
2	4.0	2.0	2.0	16	270	1500	9	0	3.0	0	1	4	0
2	4.1	14.8	14.8	16	090	1500	9	0	3.0	0	1	6	0
2	4.1	14.7	14.7	16	090	1500	9	0	3.0	0	1	4	0
2	4.2	12.5	12.5	16	270	1500	9	0	3.0	0	1	10	0
2	4.2	7.1	7.1	16	270	1500	9	0	3.0	0	1	10	0
2	4.2	5.5	5.5	16	090	1500	9	0	3.0	0	1	4	0
2	4.2	11.6	11.6	16	090	1500	9	0	3.0	0	1	6	0
2	4.3	12.3	12.3	16	270	1500	8	0	3.0	0	0	10	0
2	4.3	9.6	9.6	16	090	1500	8	0	3.0	0	0	4	0
2	4.4	12.6	12.6	16	090	1500	8	0	3.0	0	1	10	0
2	4.5	4.8	4.8	16	270	1500	8	0	3.0	0	0	6	0
2	4.5	11.4	11.4	16	090	1500	8	0	3.0	0	0	6	0
2	4.7	11.5	11.5	16	270	1500	5	-1	3.0	1	0	10	0
2	4.7	9.2	9.2	16	090	1500	5	-1	3.0	1	0	6	0
2	4.7	11.9	11.9	16	090	1500	5	-1	3.0	1	0	10	0
1	2.9	2.0	1.7	16	056	1500	7	-1	3.0	0	0	4	0
1	1.2	15.7	15.7	16	270	1500	10	0	3.0	0	1	45	3
2	2.4	4.9	4.9	16	090	1500	7	0	2.6	0	1	6	0
2	2.5	14.3	14.3	16	270	1500	7	0	2.6	0	1	45	3
2	0.1	9.8	9.8	16	090	1500	13	0	3.0	0	0	45	3
2	2.8	14.9	14.9	16	270	1500	7	0	3.0	0	1	10	0
2	2.8	2.6	2.6	16	270	1500	7	0	3.0	0	1	4	0
2	2.8	3.5	3.5	16	090	1500	7	0	3.0	0	1	6	0
2	2.8	9.0	9.0	16	090	1500	7	0	3.0	0	1	4	0
2	2.8	10.7	10.7	16	090	1500	7	0	3.0	0	1	41	3
2	2.9	13.9	13.9	16	270	1500	7	0	3.0	0	0	10	0
2	2.9	4.2	4.2	16	270	1500	7	0	3.0	0	0	6	0
2	2.9	8.0	8.0	16	090	1500	7	0	3.0	0	0	6	0
2	2.9	9.6	9.6	16	090	1500	7	0	3.0	0	0	45	3
2	3.0	8.7	8.7	16	270	1500	7	0	3.0	0	1	6	6
2	3.0	6.2	6.2	16	270	1500	7	0	3.0	0	1	4	0
2	3.0	3.8	3.8	16	090	1500	7	0	3.0	0	1	10	0
2	2.9	8.7	8.7	16	090	1500	7	0	3.0	0	1	6	0
2	2.9	10.0	10.0	16	090	1500	7	0	3.0	0	1	37	2
2	3.0	8.7	8.7	16	270	1500	7	0	3.0	0	0	6	0
2	3.0	6.3	6.3	16	270	1500	7	0	3.0	0	0	6	0
2	3.0	3.9	3.9	16	090	1500	7	0	3.0	0	0	6	0
2	3.1	8.7	8.7	16	090	1500	7	0	3.0	0	0	6	0
2	3.1	13.6	13.6	16	090	1500	7	0	3.0	0	0	54	3
2	4.8	1.8	1.8	16	270	1500	6	1	3.0	1	0	10	0

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
1	0.1	7.4	6.9	16	115	1000	7.2	0	2.3	0	0	4	0
1	0.2	4.7	1.7	16	021	1000	7.2	-1	2.3	0	0	10	0
1	0.3	5.2	1.9	16	022	1000	7.2	-1	2.3	0	0	6	0
1	0.5	1.8	0.1	16	000	2000	12.4	-1	2.6	0	0	10	0
1	0.7	7.4	5.1	16	044	2000	11.1	0	2.6	0	0	10	0
1	1.0	3.4	3.4	16	087	2000	5.4	0	2.0	0	0	10	0
1	1.2	6.2	4.2	16	318	2000	5.4	0	2.0	0	0	6	0
1	1.3	6.5	3.8	16	036	2000	5.4	-1	2.0	0	0	10	0
1	1.3	6.4	0.8	16	008	2000	5.4	-1	2.0	0	0	10	0
1	1.4	7.4	4.7	16	040	2000	5.4	-1	2.0	0	0	6	0
1	1.4	10.8	10.6	16	101	2000	5.4	0	2.0	0	0	4	0
1	1.6	6.0	1.0	16	351	2000	9.9	-1	2.6	0	1	10	0
1	1.7	8.2	1.7	16	348	2000	9.9	-1	2.3	0	1	10	0
1	1.7	6.9	5.9	16	121	2000	9.9	0	2.3	0	1	10	0
1	1.8	5.7	5.2	16	249	2000	9.9	0	2.3	0	1	6	0
1	2.0	7.2	7.2	16	276	2000	7.4	0	2.3	0	0	4	0
1	2.0	8.3	8.2	16	101	2000	7.4	0	2.3	0	0	6	0
1	2.1	10.1	9.8	16	280	2000	7.4	0	2.3	0	0	54	3
1	2.2	10.0	8.8	16	059	2000	7.4	1	2.3	0	0	6	0
1	2.2	6.1	6.1	16	280	2000	7.4	-1	2.3	0	0	10	0
1	2.2	13.0	13.0	16	271	2000	7.4	-1	2.3	0	0	10	0
1	2.3	6.7	0.6	16	006	2000	7.4	-1	2.3	0	0	10	0
1	2.3	6.5	4.1	16	320	2000	7.4	0	2.3	0	0	4	0
1	2.3	8.3	7.5	16	066	2000	7.4	-1	2.3	0	0	10	0
1	2.4	5.8	5.8	16	270	2000	7.4	0	2.3	0	0	10	0
1	2.4	11.2	0.8	16	004	2000	7.4	-1	2.3	0	0	4	0
1	2.4	10.7	5.4	16	330	2000	7.4	-1	2.3	0	0	6	0
1	2.7	2.9	1.5	16	034	2000	10.5	-1	2.6	0	1	6	0
1	2.7	3.7	1.2	16	328	2000	10.5	-1	2.6	0	1	6	0
1	2.8	11.6	4.4	16	358	2000	10.5	-1	2.0	0	1	10	0
1	3.1	13.1	11.2	16	059	2000	7.0	1	2.0	0	0	6	0
1	3.2	6.0	5.8	16	105	2000	7.0	0	2.0	0	0	6	0
1	3.3	5.6	4.0	16	315	2000	7.0	0	2.0	0	0	41	3
1	3.4	5.5	1.5	16	344	2000	7.0	0	2.0	0	0	41	3
1	3.5	4.2	0.9	16	012	2000	5.4	-1	2.0	0	0	6	0
1	3.8	6.7	1.4	16	348	2000	9.3	-1	2.6	0	1	10	0
1	3.8	8.7	8.4	16	288	2000	9.3	-1	2.6	0	1	6	0
1	3.8	4.2	0.9	16	350	2000	9.3	-1	2.6	0	1	10	0
1	4.3	8.2	6.3	16	310	2000	6.2	0	2.3	0	0	10	0
1	4.5	6.3	4.9	16	051	2000	6.2	-1	2.3	0	0	10	0
1	4.5	6.4	2.1	16	019	2000	6.2	-1	2.3	0	0	10	0
1	4.5	8.9	7.5	16	302	2000	6.2	0	2.3	0	0	10	0
1	4.5	9.2	3.4	16	338	2000	7.0	-1	2.3	0	0	6	0
1	4.8	10.3	0.9	16	355	2000	8.6	-1	2.6	0	1	10	0
1	4.8	10.3	6.6	16	320	2000	8.6	-1	2.6	0	1	6	0
2	0.1	5.8	5.8	16	090	1000	7.2	-1	2.3	0	0	6	0
2	0.2	15.7	15.7	16	090	1000	7.2	-1	2.3	0	0	4	0
2	0.2	14.4	14.4	16	090	1000	7.2	0	2.3	0	0	10	0
2	0.2	11.8	11.8	16	090	1000	7.2	0	2.3	0	0	10	0
2	0.3	15.4	15.4	16	090	1000	7.2	0	2.3	0	0	6	0
2	0.3	6.0	6.0	16	090	1000	7.2	0	2.3	0	0	6	0

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
2	0.5	9.8	9.8	16	090	2000	11.1	0	2.6	0	0	10	0
2	0.6	8.4	8.4	16	090	2000	11.1	0	2.6	0	0	10	0
2	0.6	3.4	3.4	16	270	2000	11.1	0	2.6	0	0	10	0
2	0.7	14.7	14.7	16	270	2000	11.1	0	2.6	0	0	6	0
2	0.7	4.7	4.7	16	270	2000	11.1	0	2.6	0	0	10	0
2	0.9	3.1	3.1	16	090	2000	6.4	0	2.0	0	0	6	0
2	0.9	0.8	0.8	16	270	2000	6.4	0	2.0	0	0	6	0
2	0.9	10.4	10.4	16	270	2000	6.4	0	2.0	0	0	6	0
2	1.0	6.1	6.1	16	270	2000	5.4	0	2.0	0	0	10	0
2	1.0	14.9	14.9	16	270	2000	5.4	0	2.0	0	0	6	0
2	1.0	9.2	9.2	16	270	2000	5.4	0	2.0	0	0	10	0
2	1.1	0.4	0.4	16	270	2000	5.4	-1	2.0	0	0	6	0
2	1.1	1[illegible].4	10.4	16	270	2000	5.4	-1	2.0	0	0	4	0
2	1.1	15.2	15.2	16	270	2000	5.4	-1	2.0	0	0	10	0
2	1.2	5.0	5.0	16	090	2000	5.4	1	2.0	0	0	4	0
2	1.2	10.0	10.0	16	090	2000	5.4	1	2.0	0	0	10	0
2	1.3	13.1	13.1	16	090	2000	5.4	0	2.0	0	0	10	0
2	1.3	9.4	9.4	16	090	2000	5.4	0	2.0	0	0	6	0
2	1.3	9.2	9.2	16	270	2000	5.4	0	2.0	0	0	10	0
2	1.4	4.6	4.6	16	270	2000	5.4	0	2.0	0	0	6	0
2	1.4	8.6	8.6	16	270	2000	5.4	0	2.0	0	0	6	0
2	1.6	10.8	10.8	16	270	2000	9.9	0	2.3	0	1	10	0
2	1.6	11.7	11.7	16	090	2000	9.9	0	2.3	0	1	6	0
2	1.6	9.6	9.6	16	090	2000	9.9	0	2.3	0	1	6	0
2	1.8	15.4	15.4	16	270	2000	9.9	0	2.3	0	1	10	0
2	1.8	7.7	7.7	16	270	2000	9.9	0	2.3	0	1	6	0
2	1.8	4.8	4.8	16	090	2000	9.9	0	2.3	0	1	10	0
2	1.8	14.8	14.8	16	090	2000	9.9	0	2.3	0	1	10	0
2	2.0	12.4	12.4	16	090	2000	7.4	0	2.3	0	0	6	0
2	2.0	1.0	1.0	16	270	2000	7.4	0	2.3	0	0	6	0
2	2.1	5.7	5.7	16	270	2000	7.4	0	2.3	0	0	6	0
2	2.1	2.8	2.8	16	090	2000	7.4	0	2.3	0	0	10	0
2	2.1	12.7	12.7	16	090	2000	7.4	0	2.3	0	0	10	0
2	2.1	9.4	9.4	16	270	2000	7.4	0	2.3	0	0	10	0
2	2.1	0.0	0.0	16	090	2000	7.4	0	2.3	0	0	10	0
2	2.2	1.1	1.1	16	270	2000	7.4	-1	2.3	0	0	4	0
2	2.2	14.8	14.8	16	270	2000	7.4	-1	2.3	0	0	41	3
2	1.3	14.1	14.1	16	090	2000	5.4	0	2.0	0	0	54	3
2	2.3	14.4	14.4	16	270	2000	7.4	1	2.3	0	0	6	0
2	2.3	9.2	9.2	16	090	2000	7.4	-1	2.3	0	0	41	3
2	2.4	4.0	4.0	16	090	2000	7.4	0	2.3	0	0	54	3
2	2.4	3.4	3.4	16	090	2000	7.4	0	2.3	0	0	10	0
2	2.4	0.4	0.4	16	270	2000	7.4	0	2.3	0	0	6	0
2	2.4	9.0	9.0	16	270	2000	7.4	0	2.3	0	0	10	0
2	2.5	13.0	13.0	16	090	2000	7.4	0	2.3	0	0	6	0
2	2.5	13.0	13.0	16	090	2000	7.4	0	2.3	0	0	37	4
2	2.5	14.6	14.6	16	270	2000	7.4	0	2.3	0	0	6	0
2	2.7	9.0	9.0	16	090	2000	10.5	0	2.6	0	1	10	0
2	2.7	11.4	11.4	16	270	2000	10.5	0	2.6	0	1	10	0
2	2.7	9.2	9.2	16	090	2000	10.5	0	2.6	0	1	52	3
2	3.1	7.4	7.4	16	270	2000	7.0	0	2.0	0	0	6	0

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
2	3.1	7.4	7.4	16	270	2000	7.0	0	2.0	0	0	37	4
2	3.2	15.0	15.0	16	090	2000	7.0	0	2.0	0	0	10	0
2	3.2	0.3	0.3	16	090	2000	7.0	0	2.0	0	0	54	3
2	3.2	2.0	2.0	16	090	2000	7.0	0	2.0	0	0	10	0
2	3.2	11.4	11.4	16	090	2000	7.0	0	2.0	0	0	10	0
2	3.3	2.4	2.4	16	270	2000	7.0	-1	2.0	0	0	10	0
2	3.3	4.8	4.8	16	090	2000	7.0	1	2.0	0	0	10	0
2	3.3	9.5	9.5	16	090	2000	7.0	1	2.0	0	0	4	0
2	3.4	15.6	15.6	16	270	2000	7.0	1	2.0	0	0	4	0
2	3.4	10.8	10.8	16	270	2000	7.0	1	2.0	0	0	10	0
2	3.4	3.6	3.6	16	270	2000	7.0	1	2.0	0	0	10	0
2	3.5	8.1	8.1	16	270	2000	7.0	0	2.0	0	0	10	0
2	3.5	6.8	6.8	16	270	2000	7.0	0	2.0	0	0	54	3
2	3.5	12.0	12.0	16	270	2000	5.4	0	2.0	0	0	6	0
2	3.5	1.1	1.1	16	090	2000	5.4	0	2.0	0	0	37	4
2	3.6	11.2	11.2	16	270	2000	5.4	0	2.0	0	0	4	0
2	3.8	0.6	0.6	16	270	2000	9.3	0	2.6	0	1	52	3
2	3.8	10.9	10.9	16	270	2000	9.3	0	2.6	0	1	6	0
2	4.2	13.0	13.0	16	090	2000	6.2	0	2.3	0	0	6	0
2	4.2	6.5	6.5	16	270	2000	6.2	0	2.3	0	0	4	0
2	4.2	0.6	0.6	16	270	2000	6.2	0	2.3	0	0	6	0
2	4.2	8.6	8.6	16	090	2000	6.2	0	2.3	0	0	6	0
2	4.2	13.9	13.9	16	270	2000	6.2	0	2.3	0	0	37	4
2	4.2	5.5	5.5	16	270	2000	6.2	0	2.3	0	0	6	0
2	4.2	3.0	3.0	16	090	2000	6.2	0	2.3	0	0	10	0
2	4.2	12.9	12.9	16	090	2000	6.2	0	2.3	0	0	10	0
2	4.3	10.5	10.5	16	270	2000	6.2	0	2.3	0	0	54	3
2	4.3	9.3	9.3	16	270	2000	6.2	0	2.3	0	0	10	0
2	4.3	0.0	0.0	16	000	2000	6.2	0	2.3	0	0	10	0
2	4.3	15.0	15.0	16	270	2000	6.2	-1	2.3	0	0	41	3
2	4.3	1.4	1.4	16	270	2000	6.2	-1	2.3	0	0	4	0
2	4.3	8.5	8.5	16	090	2000	6.2	1	2.3	0	0	6	0
2	4.4	11.4	11.4	16	090	2000	6.2	-1	2.3	0	0	10	0
2	4.4	6.6	6.6	16	090	2000	6.2	-1	2.3	0	0	4	0
2	4.4	3.2	3.2	16	270	2000	6.2	1	2.3	0	0	6	0
2	4.5	14.6	14.6	16	090	2000	6.2	0	2.3	0	0	10	0
2	4.5	15.7	15.7	16	090	2000	7.0	0	2.3	0	0	54	3
2	4.5	10.8	10.8	16	090	2000	7.0	0	2.3	0	0	6	0
2	4.6	13.1	13.1	16	090	2000	7.0	0	2.3	0	0	37	4
2	4.6	12.0	12.0	16	090	2000	7.0	0	2.3	0	0	6	0
2	4.6	6.0	6.0	16	090	2000	7.0	0	2.3	0	0	6	0
2	4.6	7.3	7.3	16	270	2000	7.0	0	2.3	0	0	6	0
2	4.8	12.6	12.6	16	090	2000	8.6	0	2.6	0	1	6	0
2	4.8	0.1	0.1	16	270	2000	8.6	0	2.6	0	1	10	0
2	4.8	9.8	9.8	16	270	2000	8.6	0	2.6	0	1	10	0
2	4.8	10.5	10.5	16	090	2000	8.6	0	2.6	0	1	6	0
2	3.1	5.2	5.2	16	090	2000	7.0	0	2.0	0	0	4	0
2	4.3	13.2	13.2	16	270	2000	6.2	-1	2.3	0	0	10	0
2	4.6	6.5	6.5	16	090	2000	7.0	0	2.3	0	0	4	0

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
1	0.1	5.0	0.1	16	359	1500	7.0	1	1.0	0	0	6	0
1	0.2	5.8	0.9	16	004	1500	7.0	0	1.0	0	0	6	0
1	0.4	6.6	0.1	16	002	1500	7.0	1	1.3	0	0	6	0
1	0.5	10.7	4.9	16	046	1500	7.0	0	1.3	0	0	6	0
1	0.8	4.0	4.0	16	090	1500	8.0	1	1.3	0	0	6	0
1	1.1	2.5	0.3	16	357	1500	8.0	1	1.3	0	0	10	0
1	1.4	5.0	1.7	16	350	1500	7.0	1	1.3	0	0	10	0
1	1.5	4.2	4.2	16	270	1500	7.0	1	1.3	0	0	10	0
1	1.9	4.5	1.8	16	335	1500	7.0	0	1.3	0	0	10	0
1	2.1	4.5	0.0	16	000	1500	7.0	1	1.3	0	0	10	0
1	2.2	2.1	1.2	16	333	1500	7.0	0	1.3	0	0	6	0
1	2.4	5.7	1.0	16	010	1500	7.0	1	1.3	0	0	6	0
1	2.5	6.1	0.9	16	355	1500	7.0	1	1.3	0	0	10	0
1	4.1	1.2	1.1	16	008	1500	3.0	-1	1.0	0	0	54	3
1	4.3	4.3	0.6	16	007	1500	3.0	0	1.0	0	0	37	4
2	0.1	10.0	10.0	16	090	1500	7.0	-1	1.0	0	0	10	0
2	0.2	8.4	8.4	16	090	1500	7.0	-1	1.0	0	0	6	0
2	0.2	13.6	13.6	16	090	1500	7.0	-1	1.0	0	0	6	0
2	0.4	9.3	9.3	16	090	1500	7.0	-1	1.3	0	0	10	0
2	0.5	6.5	6.5	16	090	1500	7.0	-1	1.3	0	0	10	0
2	0.5	1.6	1.6	16	270	1500	7.0	-1	1.3	0	0	10	0
2	0.6	13.6	13.6	16	270	1500	7.0	-1	1.3	0	0	10	0
2	0.6	4.1	4.1	16	270	1500	7.0	-1	1.3	0	0	10	0
2	0.6	4.8	4.8	16	090	1500	7.0	1	1.3	0	0	6	0
2	0.0	3.7	3.7	16	270	1500	8.0	-1	1.3	0	0	6	0
2	0.8	14.7	14.7	16	270	1500	8.0	-1	1.3	0	0	6	0
2	0.9	8.5	8.5	16	270	1500	8.0	-1	1.3	0	0	6	0
2	0.9	5.0	5.0	16	270	1500	8.0	-1	1.3	0	0	10	0
2	0.9	11.7	11.7	16	270	1500	8.0	-1	1.3	0	0	10	0
2	0.9	15.4	15.4	16	270	1500	8.0	-1	1.3	0	0	10	0
2	0.9	5.2	5.2	16	090	1500	8.0	1	1.3	0	0	6	0
2	1.1	10.8	10.8	16	270	1500	8.0	1	1.3	0	0	6	0
2	1.1	10.1	10.1	16	090	1500	8.0	-1	1.3	0	0	10	0
2	1.1	6.4	6.4	16	090	1500	8.0	-1	1.3	0	0	10	0
2	1.2	2.9	2.9	16	090	1500	8.0	-1	1.3	0	0	6	0
2	1.2	9.0	9.0	16	090	1500	8.0	-1	1.3	0	0	6	0
2	1.2	2.1	2.1	16	270	1500	8.0	1	1.3	0	0	6	0
2	1.2	9.4	9.4	16	270	1500	8.0	1	1.3	0	0	6	0
2	1.4	10.5	10.5	16	270	1500	7.0	1	1.3	0	0	6	0
2	1.4	11.8	11.8	16	090	1500	7.0	-1	1.3	0	0	6	0
2	1.5	7.9	7.9	16	090	1500	7.0	-1	1.3	0	0	10	0
2	1.5	10.2	10.2	16	090	1500	7.0	-1	1.3	0	0	10	0
2	1.6	3.0	3.0	16	270	1500	7.0	-1	1.3	0	0	10	0
2	1.6	11.6	11.6	16	270	1500	7.0	-1	1.3	0	0	10	0
2	1.6	7.1	7.1	16	270	1500	7.0	-1	1.3	0	0	6	0
2	1.6	6.5	6.5	16	090	1500	7.0	1	1.3	0	0	10	0
2	1.6	15.4	15.4	16	090	1500	7.0	1	1.3	0	0	6	0
2	1.9	13.9	13.9	16	090	1500	7.0	1	1.3	0	0	6	0
2	1.9	6.6	6.6	16	090	1500	7.0	1	1.3	0	0	6	0
2	1.9	4.5	4.5	16	270	1500	7.0	-1	1.3	0	0	6	0
2	1.9	13.9	13.9	16	270	1500	7.0	-1	1.3	0	0	4	0

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
2	1.9	1.8	1.8	16	090	1500	7.0	1	1.3	0	0	6	0
2	1.9	14.7	14.7	16	270	1500	7.0	-1	1.3	0	0	37	4
2	1.9	5.3	5.3	16	090	1500	7.0	1	1.3	0	0	10	0
2	2.0	14.7	14.7	16	270	1500	7.0	-1	1.3	0	0	54	3
2	2.0	5.3	5.3	16	270	1500	7.0	-1	1.3	0	0	10	0
2	2.0	12.4	12.4	16	270	1500	7.0	-1	1.3	0	0	10	0
2	2.0	15.5	15.5	16	090	1500	7.0	1	1.3	0	0	6	0
2	2.1	7.2	7.2	16	090	1500	7.0	-1	1.3	0	0	10	0
2	2.1	3.8	3.8	16	270	1500	7.0	1	1.3	0	0	10	0
2	2.1	10.3	10.3	16	270	1500	7.0	1	1.3	0	0	10	0
2	2.1	9.3	9.3	16	090	1500	7.0	-1	1.3	0	0	54	3
2	2.2	7.1	7.1	16	270	1500	7.0	1	1.3	0	0	6	0
2	2.2	9.3	9.3	16	090	1500	7.0	-1	1.3	0	0	37	4
2	2.2	8.4	8.4	16	090	1500	7.0	-1	1.3	0	0	4	0
2	2.2	12.5	12.5	16	270	1500	7.0	1	1.3	0	0	6	0
2	2.5	12.6	12.6	16	270	1500	7.0	1	1.3	0	0	10	0
2	2.5	3.1	3.1	16	270	1500	7.0	1	1.3	0	0	10	0
2	2.5	5.6	5.6	16	090	1500	7.0	-1	1.3	0	0	10	0
2	3.7	7.0	7.0	16	270	1500	5.0	-1	1.0	0	0	10	0
2	3.7	1.7	1.7	16	090	1500	5.0	1	1.0	0	0	10	0
2	3.7	2.5	2.5	16	270	1500	5.0	-1	1.0	0	0	6	0
2	3.7	11.1	11.1	16	090	1500	5.0	1	1.0	0	0	10	0
2	3.9	1.0	1.0	16	090	1500	5.0	-1	1.0	0	0	6	0
2	3.9	11.9	11.9	16	090	1500	5.0	1	1.0	0	0	6	0
2	3.9	0.0	0.0	16	000	1500	5.0	0	1.0	0	0	37	4
2	4.0	7.0	7.0	16	090	1500	3.0	1	1.0	0	0	6	0
2	4.0	4.4	4.4	16	090	1500	3.0	1	1.0	0	0	10	0
2	4.0	11.4	11.4	16	090	1500	3.0	1	1.0	0	0	10	0
2	4.2	0.4	0.4	16	090	1500	3.0	-1	1.0	0	0	10	0
2	4.2	6.4	6.4	16	270	1500	3.0	1	1.0	[illegible]	0	10	0
2	4.3	3.0	3.0	16	270	1500	3.0	1	1.0	0	0	6	0
1	2.6	4.2	1.0	16	324	1500	7.0	-1	1.3	0	0	10	0
1	2.9	3.8	2.5	16	346	1500	6.0	0	1.0	0	0	4	0
2	3.0	3.5	3.5	16	270	1500	6.0	-1	1.0	0	0	54	3
1	3.2	4.0	0.3	16	002	1500	6.0	0	1.0	0	0	37	4
2	1.6	14.6	14.6	16	270	1500	7.0	-1	1.3	0	0	56	3
2	2.6	7.8	7.8	16	090	1500	7.0	1	1.3	0	0	10	0
2	2.7	4.1	4.1	16	090	1500	7.0	1	1.3	0	0	6	0
2	2.9	7.0	7.0	16	090	1500	6.0	1	1.0	0	0	6	0
2	2.9	13.3	13.3	16	090	1500	6.0	1	1.0	0	0	6	0
2	2.9	4.2	4.2	16	270	1500	6.0	-1	1.0	0	0	37	4
2	3.0	9.6	9.6	16	090	1500	6.0	1	1.0	0	0	10	0
2	3.0	6.0	6.0	16	090	1500	6.0	1	1.0	0	0	10	0
2	3.0	1.3	1.3	16	270	1500	6.0	-1	1.0	0	0	10	0
2	3.1	2.8	2.8	16	270	1500	6.0	1	1.0	0	0	10	0
2	3.1	0.6	0.6	16	270	1500	6.0	1	1.0	0	0	54	3
2	3.1	10.0	10.0	16	270	1500	6.0	1	1.0	0	0	10	0
2	3.2	13.8	13.8	16	270	1500	6.0	1	1.0	0	0	10	0
2	3.3	1.4	1.4	16	270	1500	6.0	1	1.0	0	0	4	0
2	3.3	11.0	11.0	16	270	1500	6.0	1	1.0	0	0	6	0
2	3.5	8.0	8.0	16	270	1500	7.0	1	1.3	0	0	6	0

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
2	3.5	3.2	3.2	16	270	1500	7.0	1	1.3	0	0	10	0
2	3.5	11.8	11.8	16	270	1500	7.0	1	1.3	0	0	10	0

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DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
1	0.1	20.1	5.1	16	14.6	1500	11.5	1	3	0	2	35	2
1	0.2	5.2	1.4	16	15.4	1500	11.5	1	3	0	2	10	0
1	0.2	6.2	5.7	16	292.2	1500	11.5	0	3	0	2	28	3
1	0.4	8.9	7.6	16	58.2	1500	11.9	0	3	0	2	22	3
1	0.5	6.5	5.9	16	65.7	1500	11.9	0	3	0	2	30	3
1	0.5	11.4	1.8	16	9.3	1500	11.9	1	3	0	2	6	0
1	0.8	9.6	0.6	16	3.4	1500	11.9	-1	3	0	2	30	3
1	0.9	10.4	0.5	16	2.8	1500	9.9	-1	3	0	1	28	3
1	1	8.5	6.6	16	50.7	1500	9.9	-1	3	0	1	35	2
1	1.3	8.4	2.6	16	17.7	1500	11.3	1	3	0	1	35	2
1	1.3	11.9	3.1	16	14.9	1500	11.3	1	3	0	1	28	3
1	1.6	6	3.3	16	34.1	1500	11.3	1	3	0	1	30	3
1	1.9	12.8	0.7	16	3.2	1500	10.9	-1	3	0	1	30	3
1	1.9	14.3	2.5	16	10	1500	10.9	-1	2.6	0	1	22	4
1	2.1	11.4	0.6	16	3	1500	10.9	-1	2.6	0	1	28	3
2	0.1	5.4	5.4	16	90	1500	11.5	0	3	0	2	22	3
2	0.3	4.9	4.9	16	270	1500	11.9	0	3	0	2	10	0
2	0.4	0.6	0.6	16	270	1500	11.9	0	3	0	2	10	0
2	0.4	5.8	5.8	16	270	1500	11.9	0	3	0	2	10	0
2	0.5	3.8	3.8	16	270	1500	11.9	0	3	0	2	6	0
2	0.5	0	0	16	270	1500	11.9	0	3	0	2	6	0
2	0.7	7.4	7.4	16	270	1500	11	0	3	0	1	6	0
2	0.8	5.5	5.5	16	270	1500	11	0	3	0	1	6	0
2	0.8	1.7	1.7	16	270	1500	11	0	3	0	1	6	0
2	0.8	2	2	16	90	1500	9.9	0	3	0	1	22	3
2	0.9	0.3	0.3	16	90	1500	9.9	0	3	0	1	10	0
2	0.9	4.9	4.9	16	270	1500	9.9	0	3	0	1	10	0
2	0.9	0.5	0.5	16	270	1500	9.9	0	3	0	1	10	0
2	0.9	0	0	16	90	1500	9.9	0	3	0	1	10	0
2	1	6.7	6.7	16	270	1500	9.9	0	3	0	1	10	0
2	1.4	11.2	11.2	16	90	1500	11.3	0	3	0	1	10	0
2	1.4	4.4	4.4	16	90	1500	11.3	0	3	0	1	10	0
2	1.4	14.8	14.8	16	270	1500	11.3	0	3	0	1	24	3
2	1.5	4	4	16	90	1500	11.3	0	3	0	1	10	0
2	1.5	15.6	15.6	16	270	1500	11.3	0	3	0	1	6	0
2	1.5	9.1	9.1	16	90	1500	11.3	0	3	0	1	10	0
2	1.5	3.9	3.9	16	90	1500	11.3	0	3	0	1	10	0
2	1.6	1.5	1.5	16	90	1500	11.3	0	3	0	1	22	3
2	1.6	5.3	5.3	16	90	1500	11.3	0	3	0	1	6	0
2	1.6	9.2	9.2	16	90	1500	11.3	0	3	0	1	6	0
2	1.7	11.4	11.4	16	90	1500	11.3	0	3	0	1	6	0
2	1.8	7.4	7.4	16	270	1500	10.9	-1	2.6	0	1	6	0
2	1.9	5.5	5.5	16	270	1500	10.9	-1	2.6	0	1	6	0
2	1.9	1.7	1.7	16	270	1500	10.9	-1	2.6	0	1	6	0
2	2	0.3	0.3	16	90	1500	10.9	-1	2.6	0	1	10	0
2	2	4.9	4.9	16	270	1500	10.9	-1	2.6	0	1	10	0
2	2	0.5	0.5	16	270	1500	10.9	-1	2.6	0	1	10	0
2	2.1	0	0	16	270	1500	10.9	-1	2.6	0	1	10	0
2	2.1	6.7	6.7	16	270	1500	10.9	-1	2.6	0	1	10	0

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
1	0	8.7	3.6	16	24.3	1500	9.7	0	2.6	0	1	28	3
1	0	8.8	2.6	16	17.3	1500	9.7	1	2.6	0	1	23	3
1	0	10.3	7	16	42.8	1500	9.7	0	2.6	0	1	21	3
1	0.1	14.1	4.9	16	20.4	1500	9.7	0	2.6	0	1	20	3
1	0.1	12.7	2.1	16	9.3	1500	9.7	1	2.6	0	1	35	2
1	0.1	14.8	0.5	16	2	1500	9.7	1	2.6	0	1	32	4
1	0.2	21.4	5.1	16	13.9	1500	9.7	0	2.6	0	1	28	3
1	0.3	16.1	2.7	16	9.6	1500	9.7	0	2.6	0	1	30	3
1	0.5	4.4	0.7	16	9.3	1500	10.7	0	2.6	0	1	32	4
1	0.5	4.4	4.2	16	254.4	1500	10.7	-1	2.6	0	1	6	0
1	0.6	12.4	1.5	16	7.1	1500	10.7	0	2.6	0	1	6	0
1	0.7	6.6	5.6	16	57.2	1500	10.7	0	2.6	0	1	30	3
1	0.8	14.6	6.2	16	24.9	1500	10.7	0	2.6	0	1	22	3
1	0.9	13.9	5.7	16	24.4	1500	9.3	0	2.6	0	1	32	4
1	0.9	12.1	6.2	16	30.7	1500	9.3	0	2.6	0	1	35	2
1	0.9	13.2	0.4	16	1.9	1500	9.3	-1	2.3	0	1	20	3
1	1.3	8.9	8.8	16	84.4	1500	9.3	1	2.3	0	1	22	3
1	1.5	13.4	5.6	16	24.7	1500	9.3	1	2.3	0	1	28	3
1	1.5	11.1	10.7	16	73.9	1500	9.3	1	2.3	0	1	22	3
1	1.7	13.3	5	16	22.3	1500	9.3	-1	2.3	0	1	30	3
1	1.8	14.2	8.7	16	37.8	1500	9.3	-1	2.3	0	1	24	3
1	2.1	12.5	12.5	16	94.1	1500	7	1	2	0	1	28	3
1	2.4	11.5	6.4	16	33.4	1500	6.8	1	2	0	1	30	4
1	2.4	4.8	4.8	16	266.9	1500	6.8	0	2	0	1	24	3
1	2.5	5.1	0.5	16	5.6	1500	6.8	1	2	0	1	30	3
1	2.7	14.6	1.5	16	5.8	1500	6.8	-1	2	0	1	24	3
1	2.7	15.3	0.8	16	3.1	1500	6.8	-1	2	0	1	30	4
2	0.1	0.6	0.6	16	270	1500	9.7	-1	2.6	0	1	22	3
2	0.3	0.4	0.4	16	270	1500	9.7	1	2.6	0	1	22	3
2	0.3	3.3	3.3	16	90	1500	9.7	1	2.6	0	1	10	0
2	0.4	2.8	2.8	16	270	1500	10.7	1	2.6	0	1	6	0
2	0.4	3.7	3.7	16	270	1500	10.7	1	2.6	0	1	6	0
2	0.4	0.4	0.4	16	90	1500	10.7	1	2.6	0	1	6	0
2	0.4	0.2	0.2	16	90	1500	10.7	1	2.6	0	1	6	0
2	0.6	4.9	4.9	16	270	1500	10.7	1	2.3	0	1	32	4
2	0.7	5.7	5.7	16	270	1500	10.7	1	2.3	0	1	6	0
2	0.7	6	6	16	270	1500	10.7	1	2.3	0	1	6	0
2	0.7	1.8	1.8	16	270	1500	10.7	1	2.3	0	1	6	0
2	0.8	2.8	2.8	16	270	1500	10.7	1	2.3	0	1	6	0
2	0.8	8.7	8.7	16	270	1500	10.7	1	2.3	0	1	10	0
2	0.8	0.3	0.3	16	270	1500	10.7	1	2.3	0	1	28	3
2	1.1	1.5	1.5	16	90	1500	9.3	-1	2.3	0	1	21	3
2	1.1	5.4	5.4	16	270	1500	9.3	1	2.3	0	1	23	3
2	1.1	0.8	0.8	16	270	1500	9.3	1	2.3	0	1	28	3
2	1.2	6.2	6.2	16	90	1500	9.3	1	2.3	0	1	28	3
2	1.3	10.8	10.8	16	90	1500	9.3	1	2.3	0	1	23	3
2	1.3	4	4	16	90	1500	9.3	1	2.3	0	1	21	3
2	1.4	6.3	6.3	16	90	1500	9.3	1	2.3	0	1	20	3
2	1.4	11.6	11.6	16	90	1500	9.3	1	2.3	0	1	35	2
2	1.4	11.1	11.1	16	90	1500	9.3	1	2.3	0	1	32	4
2	1.5	14.9	14.9	16	270	1500	9.3	-1	2.3	0	1	24	3

September 25, 1992 Search 1

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
2	1.5	14.1	14.1	16	90	1500	9.3	1	2.3	0	1	10	0
2	1.5	11.3	11.3	16	270	1500	9.3	-1	2.3	0	1	30	3
2	1.6	8.2	8.2	16	90	1500	9.3	1	2.3	0	1	6	0
2	1.6	10.5	10.5	16	90	1500	9.3	1	2.3	0	1	30	3
2	1.6	7.3	7.3	16	90	1500	9.3	1	2.3	0	1	6	0
2	1.6	11.4	11.4	16	90	1500	9.3	1	2.3	0	1	6	0
2	1.7	12.7	12.7	16	270	1500	9.3	1	2	0	1	6	0
2	1.7	13.9	13.9	16	270	1500	9.3	1	2	0	1	6	0
2	1.8	11.7	11.7	16	270	1500	9.3	1	2	0	1	28	3
2	1.8	10.5	10.5	16	90	1500	7	-1	2	0	1	30	4
2	2	13.8	13.8	16	270	1500	7	1	2	0	1	20	3
2	2	10.1	10.1	16	270	1500	7	1	2	0	1	21	3
2	2.2	14.9	14.9	16	90	1500	7	0	2	0	1	21	[illegible]
2	2.7	5.2	5.2	16	270	1500	6.8	0	2	0	1	30	3

September 25, 1992 Search 2

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
1	3.17	4.9	4.8	32	77.1	1500	6.2	1	1.6	0	1	28	3
1	3.17	12.3	9.3	32	49	1500	6.2	1	1.6	0	1	23	3
1	3.18	16.3	8.4	32	31.1	1500	6.2	1	1.6	0	1	22	3
1	3.2	17.9	5.6	32	18	1500	6.2	1	1.6	0	1	20	3
1	3.21	23.6	10.4	32	26.1	1500	6.2	1	1.6	0	1	35	2
1	3.21	28.9	10	32	20.3	1500	6.2	1	1.6	0	1	32	4
1	3.49	12.3	8	32	40.5	1500	6	1	1.6	0	1	30	3
1	3.58	16.8	8.5	32	30.6	1500	6	1	1.6	0	1	32	4
1	3.88	28.5	13.9	32	29.1	1500	5.2	0	1.6	0	1	28	3
1	3.9	30.3	6.7	32	12.8	1500	5.2	-1	1.6	0	1	24	3
1	3.94	27.1	18.4	32	42.7	1500	5.2	0	1.6	0	1	22	3
1	3.94	27.8	10.1	32	21.4	1500	5.2	-1	1.6	0	1	30	4
1	4.05	22.2	19.1	32	59.3	1500	5.2	0	1.6	0	1	32	4
1	4.06	26.3	14.8	32	34.4	1500	5.2	0	1.6	0	1	20	3
2	3.21	3.1	3.1	32	90	1500	6.2	1	2	0	1	21	3
2	3.39	19.1	19.1	32	270	1500	6	-1	2	0	1	30	4
2	3.42	16	16	32	270	1500	6	-1	2	0	1	24	3
2	3.43	8.9	8.9	32	90	1500	6	1	2	0	1	22	3
2	3.46	4.2	4.2	32	90	1500	6	1	2	0	1	28	3
2	3.47	12.7	12.7	32	90	1500	6	1	2	0	1	10	0
2	3.49	12.4	12.4	32	270	1500	6	-1	2	0	1	30	3
2	3.54	6.6	6.6	32	90	1500	6	1	2	0	1	6	0
2	3.58	5.6	5.6	32	90	1500	6	1	2	0	1	6	0
2	3.58	9.8	9.8	32	90	1500	6	1	2	0	1	6	0
2	3.62	9.5	9.5	32	90	1500	6	1	2	0	1	6	0
2	3.64	5.2	5.2	32	90	1500	6	1	2	0	1	6	0
2	3.82	18.5	18.5	32	270	1500	6	1	2	0	0	32	4
2	3.83	15	15	32	270	1500	6	1	2	0	0	6	0
2	3.86	19.3	19.3	32	270	1500	6	1	2	0	0	6	0
2	3.89	19.5	19.5	32	270	1500	5.2	1	2	0	0	6	0
2	3.89	15.4	15.4	32	270	1500	5.2	1	2	0	0	6	0
2	3.93	16.3	16.3	32	270	1500	5.2	1	2	0	0	6	0
2	3.93	17.5	17.5	32	270	1500	5.2	1	2	0	0	30	3
2	3.98	2.9	2.9	32	90	1500	5.2	-1	2	0	0	30	3
2	3.99	22.3	22.3	32	270	1500	5.2	1	2	0	0	10	0
2	4.14	19.7	19.7	32	270	1500	5.2	1	2	0	0	35	2
2	4.2	17.8	17.8	32	270	1500	5.2	1	2	0	0	22	3
2	4.23	19	19	32	270	1500	5.2	1	2	0	0	23	3
2	4.23	13.3	13.3	32	270	1500	5.2	1	2	0	0	21	3
2	4.27	14.3	14.3	32	270	1500	5.2	1	2	0	0	28	3

September 25, 1992 Search 3

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WHCAPS	SIZE	TGTREF
1	4.39	14.6	14.4	32	98.4	1500	5.6	1	1.6	0	0	28	3
1	4.42	18.9	17.6	32	69.3	1500	5.6	1	1.6	0	0	22	3
1	4.45	18	14.9	32	56.1	1500	5.6	1	1.6	0	0	20	3
1	4.45	24.4	19.7	32	53.7	1500	5.6	1	1.6	0	0	35	2
1	4.45	28.5	19.2	32	42.3	1500	5.6	1	1.6	0	0	32	4
1	4.46	30.1	9.1	32	17.7	1500	5.6	0	1.6	0	0	30	4
1	4.49	28.4	6.3	32	13	1500	5.6	0	1.6	0	0	24	3
1	4.54	28.8	14.1	32	29.3	1500	5.6	1	1.6	0	0	28	3
1	4.57	24.2	2.4	32	5.7	1500	5.6	0	1.6	0	0	30	3
1	5.01	17.3	12.8	32	47.9	1500	5.6	0	1.6	0	0	32	4
1	5.06	24	7.7	32	18.7	1500	5.6	0	1.6	0	0	30	3
1	5.15	19.2	4.4	32	13.2	1500	5.6	0	1.6	0	0	28	3
1	5.19	30.3	19.2	32	39.3	1500	5.6	-1	1.6	0	0	30	4
1	5.2	17.4	8.7	32	330.1	1500	5.6	0	1.6	0	0	22	3
1	5.27	24.9	10.2	32	24.2	1500	5.6	0	1.6	0	0	35	2
1	5.33	24.6	7.7	32	18.2	1500	5.6	0	1.6	0	0	22	3
2	4.42	13.6	13.6	32	90	1500	5.6	1	1.6	0	0	21	3
2	4.42	18.9	18.9	32	90	1500	5.6	1	1.6	0	0	23	3
2	4.63	18.8	18.8	32	90	1500	5.6	1	1.6	0	0	22	3
2	4.67	22.7	22.7	32	90	1500	5.6	1	1.6	0	0	10	0
2	4.74	17.7	17.7	32	90	1500	5.6	1	1.6	0	0	30	3
2	4.75	16.8	16.8	32	90	1500	5.6	1	1.6	0	0	6	0
2	4.79	16	16	32	90	1500	5.6	1	1.6	0	0	6	0
2	4.79	20.1	20.1	32	90	1500	5.6	1	1.6	0	0	6	0
2	4.83	19.9	19.9	32	90	1500	5.6	1	1.6	0	0	6	0
2	4.85	15.7	15.7	32	90	1500	5.6	1	1.6	0	0	6	0
2	4.86	21.7	21.7	32	90	1500	5.6	1	1.6	0	0	32	4
2	5.07	5.7	5.7	32	270	1500	8.7	1	1.6	0	0	6	0
2	5.09	10	10	32	270	1500	8.7	1	1.6	0	0	6	0
2	5.13	10.2	10.2	32	270	1500	8.7	1	1.6	0	0	6	0
2	5.13	6	6	32	270	1500	8.7	1	1.6	0	0	6	0
2	5.15	6.9	6.9	32	270	1500	8.7	1	1.6	0	0	6	0
2	5.2	12.8	12.8	32	270	1500	8.7	1	1.6	0	0	10	0
2	5.27	16.9	16.9	32	90	1500	8.7	-1	1.6	0	0	24	3
2	5.34	9.7	9.7	32	270	1500	8.7	1	1.6	0	0	32	4
2	5.4	5.7	5.7	32	270	1500	8.7	1	1.6	0	0	20	3
2	5.48	5.6	5.6	32	270	1500	8.7	1	1.6	0	0	21	3
2	5.48	9.5	9.5	32	270	1500	8.7	1	1.6	0	0	23	3
2	5.51	4.1	4.1	32	270	1500	8.7	1	1.6	0	0	28	3

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
1	0.1	3.7	3.1	16	59.2	1500	11.9	-1	2	0	1	23	3
1	0.1	9.2	5.4	16	36.1	1500	11.9	-1	2	0	1	24	3
1	0.1	7.9	1.7	16	12.5	1500	11.9	-1	2	0	1	32	4
1	0.2	6.2	0.6	16	5.3	1500	11.9	-1	2	0	1	35	2
1	0.2	12.5	5.4	16	25.9	1500	11.9	-1	2	0	1	10	0
1	0.4	4.4	1.3	16	16.8	1500	11.9	-1	2	0	1	22	3
1	0.4	7.2	5.9	16	55.1	1500	11.9	-1	2	0	1	35	2
1	0.4	4.5	0.4	16	4.5	1500	11.3	-1	2	0	1	32	4
1	0.5	10.4	0.3	16	1.5	1500	11.3	-1	2	0	1	6	0
1	0.5	5.5	2.1	16	22.7	1500	11.3	0	2	0	1	30	3
1	0.7	7.9	5.7	16	46.6	1500	11.3	1	2	0	1	32	4
1	0.8	7.3	0.7	16	5.5	1500	11.3	1	2	0	1	35	2
1	0.9	6.9	6.1	16	119.1	1500	11.3	0	2	0	1	22	3
1	1	8.2	5.9	16	46.5	1500	12.1	1	2	0	1	35	2
1	1	7.9	5.2	16	41.2	1500	12.1	1	2.3	0	1	32	4
1	1.1	2.6	2.3	16	243.2	1500	12.1	0	2.3	0	1	23	3
1	1.2	14	13.9	16	96.3	1500	12.1	-1	2.3	0	1	32	4
1	1.3	9.4	8.5	16	294.6	1500	12.1	-1	2.3	0	1	32	4
1	1.4	13.8	10.5	16	49.1	1500	12.1	0	2.3	0	1	32	4
1	1.4	14.9	11.3	16	49.9	1500	13.2	0	2.3	0	1	35	2
1	1.6	10.9	7.1	16	40.8	1500	13.2	-1	2.3	0	1	30	3
1	1.6	9	5.5	16	37.6	1500	13.2	0	2.3	0	1	35	2
1	1.8	2.9	1.5	16	31.4	1500	13.2	0	2.3	0	1	30	3
1	1.9	2	1.9	16	86.4	1500	13.2	-1	2.3	0	1	24	3
1	2	8.1	8.1	16	90.2	1500	13	-1	2.3	0	1	30	4
1	2.1	13.2	5.2	16	23.3	1500	13	0	2.3	0	1	32	4
1	2.6	7.4	1.8	16	14.4	1500	15.2	0	2.3	0	1	30	3
1	2.9	8.6	0.9	16	6.1	1500	15.2	1	2.3	0	1	30	4
2	0.1	1.4	1.4	16	90	1500	11.9	1	2	0	1	10	0
2	0.1	10.6	10.6	16	90	1500	11.9	1	2	0	1	35	3
2	0.3	1.5	1.5	16	90	1500	11.9	1	2	0	1	10	0
2	0.3	5.3	5.3	16	270	1500	11.9	1	2	0	1	10	0
2	0.3	1.8	1.8	16	90	1500	11.9	1	2	0	1	23	3
2	0.5	1	1	16	90	1500	11.3	1	2	0	1	6	0
2	0.5	5.2	5.2	16	270	1500	11.3	1	2	0	1	6	0
2	0.5	0.7	0.7	16	90	1500	11.3	1	2.3	0	1	6	0
2	0.5	4.8	4.8	16	270	1500	11.3	1	2.3	0	1	6	0
2	0.7	5.7	5.7	16	270	1500	11.3	1	2.3	0	1	6	0
2	0.7	0.7	0.7	16	270	1500	11.3	1	2.3	0	1	6	0
2	0.7	7.5	7.5	16	270	1500	11.3	1	2.3	0	1	30	3
2	0.7	6.2	6.2	16	270	1500	11.3	1	2.3	0	1	6	0
2	0.7	0.2	0.2	16	270	1500	11.3	1	2.3	0	1	6	0
2	0.7	6.4	6.4	16	270	1500	11.3	1	2.3	0	1	6	0
2	0.8	12.8	12.8	16	90	1500	11.3	-1	2.3	0	1	30	3
2	0.9	7.2	7.2	16	270	1500	11.3	1	2.3	0	1	23	3
2	0.9	0.1	0.1	16	270	1500	11.3	1	2.3	0	1	10	0
2	0.9	6.9	6.9	16	270	1500	12.1	1	2.3	0	1	10	0
2	0.9	13	13	16	90	1500	12.1	-1	2.3	0	1	24	3
2	0.9	0.1	0.1	16	90	1500	12.1	1	2.3	0	1	10	0
2	1.1	16	16	16	270	1500	12.1	1	2.3	0	1	35	3
2	1.1	0.2	0.2	16	270	1500	12.1	1	2.3	0	1	24	3

September 28, 1992

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
2	1.11	6	6	16	270	1500	12.1	1	2.3	0	1	22	3
2	1.22	15.2	15.2	16	90	1500	12.1	0	2.3	0	1	23	3
2	1.27	10.2	10.2	16	270	1500	12.1	-1	2.3	0	1	23	3
2	1.3	14.5	14.5	16	270	1500	12.1	-1	2.3	0	1	31	2
2	1.31	8.2	8.2	16	90	1500	12.1	1	2.3	0	1	23	3
2	1.38	12.1	12.1	16	90	1500	12.1	1	2.3	0	1	22	3
2	1.4	7.6	7.6	16	90	1500	12.1	1	2.3	0	1	24	3
2	1.5	13.9	13.9	16	270	1500	13.2	-1	2.3	0	1	30	4
2	1.5	5.3	5.3	16	90	1500	13.2	1	2.3	0	1	10	0
2	1.5	12.3	12.3	16	90	1500	13.2	1	2.3	0	1	10	0
2	1.5	8	8	16	270	1500	13.2	-1	2.3	0	1	24	3
2	1.6	5.5	5.5	16	90	1500	13.2	1	2.3	0	1	10	0
2	1.6	12.5	12.5	16	90	1500	13.2	1	2.3	0	1	23	3
2	1.6	11.6	11.6	16	90	1500	13.2	1	2.3	0	1	22	3
2	1.6	15	15	16	270	1500	13.2	1	2.3	0	1	6	0
2	1.7	5.6	5.6	16	90	1500	13.2	1	2.3	0	1	6	0
2	1.7	11.8	11.8	16	90	1500	13.2	1	2.3	0	1	6	0
2	1.7	11.5	11.5	16	90	1500	13.2	0	2.3	0	1	32	4
2	1.7	11	11	16	270	1500	13.2	-1	2.3	0	1	6	0
2	1.8	11.2	11.2	16	270	1500	13.2	1	2.3	0	1	35	2
2	1.8	9.2	9.2	16	90	1500	13.2	-1	2.3	0	1	6	0
2	1.8	11.3	11.3	16	270	1500	13.2	-1	2.3	0	1	10	0
2	1.9	11.2	11.2	16	270	1500	13.2	-1	2.3	0	1	10	0
2	2.2	10.7	10.7	16	90	1500	13	0	2.3	0	1	23	3
2	2.2	6.1	6.1	16	90	1500	13	0	2.3	0	1	31	2
2	2.24	5.5	5.5	16	270	1500	13	0	2.3	0	1	23	3
2	2.2	0.3	0.3	16	90	1500	13	0	2.3	0	1	32	4
2	2.4	0.3	0.3	16	270	1500	13	1	2.3	0	1	31	2
2	2.5	3.6	3.6	16	270	1500	15.2	-1	2.3	0	1	30	4
2	2.6	2.3	2.3	16	90	1500	15.2	0	2.3	0	1	24	3
2	2.7	4.1	4.1	16	270	1500	15.2	-1	2.3	0	1	6	0
2	2.8	1.5	1.5	16	270	1500	15.2	-1	2.3	0	1	6	0
2	2.8	6	6	16	270	1500	15.2	1	2.3	0	1	30	3
2	2.8	4.6	4.6	16	270	1500	15.2	0	2.3	0	1	24	3

September 30, 1992 Search 1

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
1	0	6.9	2.7	16	23.1	1500	12.4	0	2.3	0	1	6	0
1	0	7.2	1.2	16	9.7	1500	12.4	0	2.3	0	1	32	4
1	0	11.7	10.4	16	62.6	1500	12.4	1	2.3	0	1	6	0
1	0.1	11.1	9.8	16	62.7	1500	12.4	-1	2.3	0	1	22	3
1	0.1	12	9.7	16	54	1500	12.4	0	2.3	0	1	32	4
1	0.2	10.8	5.7	16	32	1500	12.4	0	2.3	0	1	35	2
1	0.2	10.4	4.3	16	24.4	1500	12.4	0	2.3	0	1	28	3
2	0	3.9	3.9	16	270	1500	12.4	1	2.3	0	1	23	3
2	0.1	5.3	5.3	16	270	1500	12.4	0	2.3	0	1	22	4
2	0.1	9.8	9.8	16	270	1500	12.4	1	2.3	0	1	31	2
2	0.1	10	10	16	90	1500	12.4	-1	2.3	0	1	24	3
2	0.1	2.7	2.7	16	90	1500	12.4	-1	2.3	0	1	23	3
2	0.2	9.4	9.4	16	90	1500	12.4	-1	2.3	0	1	6	0
2	0.2	9.5	9.5	16	90	1500	12.4	-1	2.3	0	1	10	0

September 30, 1992 Search 2

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
1	0	13.8	9.6	32	44.2	1500	12.4	0	2.3	0	1	35	2
1	0.1	9.2	3.1	32	20	1500	12.4	0	2.3	0	1	22	3
1	0.3	4.1	3.7	32	66.3	1500	11.3	-1	2.3	0	1	30	3
1	0.7	8.4	4.9	32	36	1500	11.1	0	2.3	0	1	30	3
1	0.8	13.2	11.4	32	60.1	1500	11.1	1	2.3	0	1	30	4
1	1.15	14.1	13.3	32	289.7	1500	11.1	0	2.3	0	1	22	4
1	1.15	4.3	0.4	32	354	1500	11.1	0	2.3	0	1	31	2
1	0.9	12	8.6	32	45.8	1500	11.1	0	2.3	0	1	6	0
2	0	24.9	24.9	32	270	1500	12.4	1	2.3	0	1	30	4
2	0.1	4.2	4.2	32	90	1500	12.4	0	2.3	0	1	10	0
2	0.1	13.4	13.4	32	270	1500	12.4	1	2.3	0	1	30	3
2	0.1	16	16	32	270	1500	12.4	0	2.3	0	1	6	0
2	0.31	9.8	9.8	32	90	1500	12.4	-1	2.3	0	1	24	3
2	0.1	4.7	4.7	32	90	1500	12.4	0	2.3	0	1	10	0
2	0.1	9	9	32	90	1500	12.4	0	2.3	0	1	10	0
2	0.1	3.8	3.8	32	90	1500	12.4	0	2.3	0	1	10	0
2	0.2	8.8	8.8	32	90	1500	11.3	0	2.3	0	1	6	0
2	0.2	2.1	2.1	32	90	1500	11.3	0	2.3	0	1	6	0
2	0.3	9.4	9.4	32	90	1500	11.3	0	2.3	0	1	6	0
2	0.3	3.8	3.8	32	90	1500	11.3	0	2.3	0	1	6	0
2	0.3	4.2	4.2	32	90	1500	11.3	0	2.3	0	1	6	0
2	0.4	10.5	10.5	32	90	1500	11.3	-1	2.3	0	1	21	3
2	0.5	20.5	20.5	32	270	1500	11.3	-1	2.3	0	1	21	3
2	0.5	14.2	14.2	32	270	1500	11.3	0	2.3	0	1	6	0
2	0.5	14	14	32	270	1500	11.3	-1	2.3	0	1	30	3
2	0.6	13.8	13.8	32	270	1500	11.3	0	2.3	0	1	6	0
2	0.6	19.3	19.3	32	270	1500	11.3	0	2.3	0	1	6	0
2	0.6	12.1	12.1	32	270	1500	11.3	0	2.3	0	1	6	0
2	0.6	18.8	18.8	32	270	1500	11.3	0	2.3	0	1	6	0
2	0.7	13.2	13.2	32	270	1500	11.3	-1	2.3	0	1	22	3
2	0.7	13.6	13.6	32	270	1500	11.3	0	2.3	0	1	10	0
2	0.7	18.8	18.8	32	270	1500	11.3	0	2.3	0	1	10	0
2	0.7	14.5	14.5	32	270	1500	11.1	0	2.3	0	1	10	0
2	0.7	20.1	20.1	32	270	1500	11.1	-1	2.3	0	1	35	2
2	0.7	20.1	20.1	32	270	1500	11.1	-1	2.3	0	1	24	3
2	0.7	6.2	6.2	32	90	1500	11.1	0	2.3	0	1	6	0
2	0.8	14	14	32	270	1500	11.1	-1	2.3	0	1	10	0
2	0.8	19.2	19.2	32	270	1500	11.1	0	2.3	0	1	10	0
2	0.8	14.2	14.2	32	270	1500	11.1	-1	2.3	0	1	28	3
2	0.8	14.3	14.3	32	270	1500	11.1	-1	2.3	0	1	35	2
2	0.8	19.1	19.1	32	270	1500	11.1	0	2.3	0	1	6	0
2	0.9	15.4	15.4	32	270	1500	11.1	-1	2.3	0	1	32	4
2	0.9	19.6	19.6	32	270	1500	11.1	0	2.3	0	1	22	3
2	0.9	12.5	12.5	32	270	1500	11.1	0	2.3	0	1	23	3
2	0.9	0.7	0.7	32	90	1500	11.1	0	2.3	0	1	6	0
2	0.9	20.4	20.4	32	270	1500	11.1	0	2.3	0	1	24	3
2	0.9	6.3	6.3	32	270	1500	11.1	0	2.3	0	1	23	3
2	0.9	7.2	7.2	32	270	1500	11.1	0	2.3	0	1	32	4

September 30, 1992 Search 3

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
1	1.31	13.5	0.8	32	3.3	1500	11.1	0	2.3	0	1	32	4
1	1.31	7.5	4.1	32	32.7	1500	11.1	0	2.3	0	1	6	0
1	1.32	8.8	0.4	32	2.8	1500	11.1	0	2.3	0	1	31	2
1	1.48	14.5	14.4	32	93.5	1500	9.7	-1	2.3	0	1	32	4
1	1.52	8.2	4.3	32	31.5	1500	9.7	0	2.3	0	1	30	3
1	1.53	16	15.4	32	73.9	1500	9.7	-1	2.3	0	1	28	3
1	1.64	13.9	12.8	32	66.8	1500	9.7	-1	2.3	0	1	22	3
1	1.94	8	5.1	32	39.6	1500	8.9	0	2.3	0	1	30	3
1	2.04	3.8	3.8	32	81.4	1500	8.9	-1	2.3	0	1	6	0
1	2.12	7.1	3.2	32	26.6	1500	8.9	0	2.3	0	1	22	3
1	2.23	8.6	5.8	32	42.1	1500	8.9	0	2.3	0	1	28	3
1	2.26	9.6	4.4	32	27.6	1500	8.9	0	2.3	0	1	35	2
1	2.34	20.9	3	32	8.2	1500	8.9	0	2.3	0	1	32	4
1	2.37	9.6	9.6	32	86.4	1500	8.9	-1	2.3	0	1	22	3
1	2.39	14.7	9.7	32	41.4	1500	8.9	0	2.3	0	1	31	2
1	2.4	7.3	2.5	32	20.4	1500	8.9	0	2.3	0	1	23	3
2	1.33	9.1	9.1	32	90	1500	11.1	-1	2.3	0	1	6	0
2	1.34	6.4	6.4	32	90	1500	11.1	-1	2.3	0	1	23	3
2	1.34	12.8	12.8	32	90	1500	11.1	-1	2.3	0	1	23	3
2	1.34	20.6	20.6	32	90	1500	11.1	-1	2.3	0	1	24	3
2	1.34	5.4	5.4	32	90	1500	11.1	0	2.3	0	1	22	4
2	1.46	20.2	20.2	32	90	1500	9.7	-1	2.3	0	1	22	3
2	1.48	19.3	19.3	32	90	1500	9.7	-1	2.3	0	1	6	0
2	1.52	14.4	14.4	32	90	1500	9.7	-1	2.3	0	1	35	2
2	1.52	19.4	19.4	32	90	1500	9.7	-1	2.3	0	1	10	0
2	1.54	8.1	8.1	32	270	1500	9.7	1	2.3	0	1	30	4
2	1.56	14.2	14.2	32	90	1500	9.7	-1	2.3	0	1	10	0
2	1.59	20.6	20.6	32	90	1500	9.7	-1	2.3	0	1	35	2
2	1.59	6	6	32	270	1500	9.7	-1	2.3	0	1	6	0
2	1.59	14.7	14.7	32	90	1500	9.7	-1	2.3	0	1	10	0
2	1.63	19	19	32	90	1500	9.7	-1	2.3	0	1	10	0
2	1.64	13.9	13.9	32	90	1500	9.7	-1	2.3	0	1	10	0
2	1.66	4.3	4.3	32	270	1500	9.7	1	2.3	0	1	24	3
2	1.7	19	19	32	90	1500	9.7	-1	2.3	0	1	6	0
2	1.74	12.3	12.3	32	90	1500	9.7	-1	2.3	0	1	6	0
2	1.75	19.6	19.6	32	90	1500	9.7	-1	2.3	0	1	6	0
2	1.76	14.1	14.1	32	90	1500	9.7	-1	2.3	0	1	6	0
2	1.83	14.6	14.6	32	90	1500	9.7	-1	2.3	0	1	6	0
2	1.84	15.4	15.4	32	90	1500	9.7	0	2.3	0	1	30	3
2	1.85	21.4	21.4	32	90	1500	9.7	0	2.3	0	1	21	3
2	1.96	11.2	11.2	32	270	1500	8.9	-1	2.3	0	1	21	3
2	1.99	4.4	4.4	32	270	1500	8.9	-1	2.3	0	1	6	0
2	2.07	9.5	9.5	32	270	1500	8.9	-1	2.3	0	1	6	0
2	2.08	2.3	2.3	32	270	1500	8.9	-1	2.3	0	1	6	0
2	2.12	8.9	8.9	32	270	1500	8.9	-1	2.3	0	1	6	0
2	2.15	14.3	14.3	32	90	1500	8.9	1	2.3	0	1	24	3
2	2.18	3.8	3.8	32	270	1500	8.9	-1	2.3	0	1	10	0
2	2.19	9	9	32	270	1500	8.9	-1	2.3	0	1	10	0
2	2.22	4.6	4.6	32	270	1500	8.9	-1	2.3	0	1	10	0
2	2.22	11.4	11.4	32	270	1500	8.9	-1	2.3	0	1	35	2
2	2.23	16.1	16.1	32	90	1500	8.9	-1	2.3	0	1	6	0

September 30, 1992 Search 3

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
2	2.26	4.1	4.1	32	270	1500	8.9	-1	2.3	0	1	10	0
2	2.26	14.1	14.1	32	90	1500	8.9	1	2.3	0	1	30	3
2	2.29	15.5	15.5	32	90	1500	8.9	1	2.3	0	1	30	4
2	2.29	9.3	9.3	32	270	1500	8.9	-1	2.3	0	1	10	0
2	2.33	9.3	9.3	32	270	1500	8.9	-1	2.3	0	1	6	0
2	2.34	4.1	4.1	32	270	1500	8.9	-1	2.3	0	1	32	4
2	2.44	11.2	11.2	32	270	1500	8.6	-1	2.3	0	1	24	3
2	2.46	9.9	9.9	32	90	1500	8.6	1	2.3	0	1	22	4
2	2.47	10.8	10.8	32	90	1500	8.6	-1	2.3	0	1	6	0
2	2.48	3.7	3.7	32	90	1500	8.6	1	2.3	0	1	23	3
2	2.48	0.9	0.9	32	90	1500	8.6	-1	2.3	0	1	6	0

September 30, 1992 Search 4

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
1	2.68	7.7	1	16	7.5	1500	8.6	0	2.3	0	1	22	3
1	2.73	7.8	5	16	40.2	1500	8.6	0	2.3	0	1	32	4
1	2.76	2.6	0.2	16	3.5	1500	8.6	0	2.3	0	1	6	0
1	2.77	8.2	4.6	16	34.1	1500	8.6	0	2.3	0	1	35	2
1	2.8	9.1	3.3	16	21.6	1500	8.6	0	2.3	0	1	30	3
1	2.93	7.7	6.2	16	53.5	1500	7.4	0	2.3	0	1	22	3
1	3.01	3.9	0.4	16	5.6	1500	7.4	0	2.3	0	1	6	0
1	3.08	9.4	3.5	16	22	1500	7.4	0	2.3	0	1	30	3
1	3.1	6.4	2.2	16	20.2	1500	7.4	0	2.3	0	1	21	3
1	3.2	7.8	3.2	16	24.2	1500	7.4	0	2.3	0	1	30	3
1	3.2	8.9	8.1	16	64.3	1500	7.4	0	2.3	0	1	21	3
1	3.23	4.1	1	16	14.3	1500	7.4	0	2.3	0	1	6	0
1	3.27	6.6	0.7	16	5.8	1500	7.4	0	2.3	0	1	6	0
1	3.32	6.5	5.9	16	65.7	1500	7.4	-1	2.3	0	1	6	0
1	3.32	2.5	1	16	23.9	1500	7.4	0	2.3	0	1	6	0
1	3.36	9.4	0.6	16	3.9	1500	7.4	0	2.3	0	1	22	3
1	3.44	6.4	5.7	16	64.3	1500	8.7	0	2.3	0	1	10	0
1	3.46	4.2	1.4	16	18.9	1500	8.7	0	2.3	0	1	10	0
1	3.48	8.2	2.6	16	18.3	1500	8.7	0	2.3	0	1	30	3
1	3.5	4.8	0.9	16	11.4	1500	8.7	0	2.3	0	1	10	0
1	3.51	11.1	1.2	16	6.4	1500	8.7	0	2.3	0	0	35	2
1	3.56	8.4	1.1	16	7.6	1500	8.7	0	2.3	0	0	32	4
1	3.67	6.7	0.7	16	5.7	1500	8.7	0	2.3	0	0	23	3
1	3.69	7	6	16	59.4	1500	8.7	1	2.3	0	0	32	4
1	3.81	11.9	11.3	16	287.3	1500	8.7	0	2.3	0	0	23	3
1	3.82	11.4	11.3	16	277.3	1500	8.7	0	2.3	0	0	6	0
1	3.88	9.9	4.6	16	27.8	1500	8.7	0	2.3	0	0	23	3
1	3.9	3	0.7	16	13.5	1500	8.7	0	2.3	0	0	32	4
1	3.97	11.5	5.8	16	30.4	1500	8	0	2.3	0	0	32	4
1	4.01	10.6	5.8	16	33	1500	8	0	2.3	0	0	35	2
1	4.04	13.1	7.1	16	33.1	1500	8	0	2.3	0	0	30	3
1	4.08	6.3	5.5	16	60.2	1500	8	-1	2.3	0	0	10	0
1	4.13	5.9	5.9	16	92.7	1500	8	-1	2.3	0	0	10	0
1	4.16	5.3	4.9	16	69.8	1500	8	-1	2.3	0	0	10	0
1	4.16	9.3	4.2	16	27.1	1500	8	0	2.3	0	0	22	3
1	4.25	5.9	3.3	16	34	1500	8	0	2.3	0	0	6	0
1	4.36	8.1	7.4	16	65.5	1500	8	1	2.3	0	0	24	3
1	4.37	9.6	9.6	16	85.1	1500	8	-1	2.3	0	0	22	3
1	4.57	11.6	11.5	16	97.2	1500	6.2	-1	2.3	0	0	32	4
1	4.63	10.6	5.2	16	29.2	1500	6.2	0	2.3	0	0	32	4
1	4.68	11.1	10.3	16	112.5	1500	6.2	-1	2.3	0	0	23	3
1	4.68	8.5	8.4	16	100.8	1500	6.2	1	2.3	0	0	22	4
1	4.7	3.6	3.6	16	94.6	1500	6.2	-1	2.3	0	0	23	3
1	4.81	15.4	10.7	16	44.2	1500	6.2	0	2.3	0	0	32	4
1	4.82	8.5	3.3	16	23	1500	6.2	0	2.3	0	0	22	4
1	4.82	12.2	12.2	16	87.5	1500	6.2	-1	2.3	0	0	6	0
1	4.96	10.3	1.1	16	6	1500	7.4	0	2.3	0	0	30	4
1	5.03	2.1	1.1	16	30.3	1500	7.4	0	2.3	0	0	30	3
1	5.06	3.6	3.2	16	61.4	1500	7.4	0	2.3	0	0	6	0
1	5.11	7.4	1.5	16	11.7	1500	7.4	0	2.3	0	0	24	3
1	5.24	7	3.7	16	31.8	1500	7.4	0	2.3	0	0	24	3

September 30, 1992 Search 4

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
1	5.32	4.6	1.9	16	24.6	1500	7.4	0	2.3	0	0	6	0
1	5.33	9	3.9	16	25.5	1500	7.4	0	2.3	0	0	30	3
1	5.36	8.7	4.1	16	28.1	1500	7.4	0	2.3	0	0	30	4
2	2.68	11.6	11.6	16	270	1500	8.6	1	2.3	0	1	32	4
2	2.68	6.2	6.2	16	270	1500	8.6	1	2.3	0	1	23	3
2	2.68	2.3	2.3	16	90	1500	8.6	0	2.3	0	1	24	3
2	2.81	0.2	0.2	16	90	1500	8.6	1	2.3	0	1	10	0
2	2.84	5	5	16	270	1500	8.6	1	2.3	0	1	10	0
2	2.88	4.5	4.5	16	270	1500	8.6	1	2.3	0	1	10	0
2	2.88	3	3	16	90	1500	8.6	-1	2.3	0	1	35	2
2	2.91	0.2	0.2	16	270	1500	8.6	1	2.3	0	1	10	0
2	2.91	5.4	5.4	16	270	1500	8.6	1	2.3	0	1	10	0
2	2.98	0.2	0.2	16	270	1500	7.4	1	2.3	0	1	6	0
2	3.02	6.9	6.9	16	270	1500	7.4	1	2.3	0	1	6	0
2	3.05	5.2	5.2	16	270	1500	7.4	1	2.3	0	1	6	0
2	3.11	4.7	4.7	16	270	1500	7.4	1	2.3	0	1	6	0
2	3.38	5.7	5.7	16	270	1500	7.4	1	2.3	0	0	6	0
2	3.44	0.6	0.6	16	270	1500	8.7	1	2.3	0	0	10	0
2	3.48	9.7	9.7	16	270	1500	8.7	-1	2.3	0	0	35	2
2	3.55	6.1	6.1	16	270	1500	8.7	1	2.3	0	0	10	0
2	3.59	6.1	6.1	16	270	1500	8.7	1	2.3	0	0	6	0
2	3.66	12.8	12.8	16	270	1500	8.7	-1	2.3	0	0	22	3
2	3.71	8.7	8.7	16	270	1500	8.7	-1	2.3	0	0	24	3
2	3.71	13.1	13.1	16	90	1500	8.7	1	2.3	0	0	31	2
2	3.73	14	14	16	90	1500	8.7	1	2.3	0	0	6	0
2	3.74	4.1	4.1	16	90	1500	8.7	1	2.3	0	0	6	0
2	3.74	7.4	7.4	16	90	1500	8.7	1	2.3	0	0	23	3
2	3.89	8.8	8.8	16	270	1500	8.7	-1	2.3	0	0	6	0
2	3.9	12.4	12.4	16	270	1500	8.7	1	2.3	0	0	22	4
2	3.9	8	8	16	270	1500	8.7	1	2.3	0	0	31	2
2	3.91	13.9	13.9	16	90	1500	8.7	-1	2.3	0	0	24	3
2	4.03	10.9	10.9	16	90	1500	8	-1	2.3	0	0	6	0
2	4.06	10.8	10.8	16	90	1500	8	-1	2.3	0	0	10	0
2	4 [illegible]7	13.2	13.2	16	270	1500	8	1	2.3	0	0	30	4
2	4.09	12.7	12.7	16	270	1500	8	1	2.3	0	0	30	3
2	4.13	14.7	14.7	16	270	1500	8	-1	2.3	0	0	6	0
2	4.14	15	15	16	90	1500	8	-1	2.3	0	0	35	2
2	4.16	10.2	10.2	16	90	1500	8	-1	2.3	0	0	10	0
2	4.2	13.1	13.1	16	270	1500	8	1	2.3	0	0	24	3
2	4.23	10.1	10.1	16	90	1500	8	-1	2.3	0	0	6	0
2	4.27	5.1	5.1	16	90	1500	8	-1	2.3	0	0	6	0
2	4.27	10.6	10.6	16	90	1500	8	-1	2.3	0	0	6	0
2	4.31	10.4	10.4	16	270	1500	8	-1	2.3	0	0	6	0
2	4.31	8.8	8.8	16	270	1500	8	-1	2.3	0	0	6	0
2	4.34	15.7	15.7	16	270	1500	8	-1	2.3	0	0	6	0
2	4.41	10.8	10.8	16	270	1500	8	-1	2.3	0	0	10	0
2	4.45	11.8	11.8	16	270	1500	6.2	-1	2.3	0	0	10	0
2	4.46	8.9	8.9	16	90	1500	6.2	-1	2.3	0	0	6	0
2	4.48	11.5	11.5	16	270	1500	6.2	-1	2.3	0	0	10	0
2	4.49	13.1	13.1	16	270	1500	6.2	-1	2.3	0	0	30	3
2	4.49	6.8	6.8	16	90	1500	6.2	1	2.3	0	0	30	3

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
2	4.52	7	7	16	90	1500	6.2	1	2.3	0	0	30	4
2	4.52	11.9	11.9	16	270	1500	6.2	-1	2.3	0	0	35	2
2	4.68	2.2	2.2	16	90	1500	6.2	1	2.3	0	0	31	2
2	4.68	2.8	2.8	16	90	1500	6.2	-1	2.3	0	0	6	0
2	4.7	7.2	7.2	16	270	1500	6.2	-1	2.3	0	0	6	0
2	4.82	2.7	2.7	16	90	1500	6.2	1	2.3	0	0	6	0
2	4.82	9	9	16	90	1500	6.2	-1	2.3	0	0	23	3
2	4.86	3.2	3.2	16	270	1500	6.2	1	2.3	0	0	31	2
2	5.15	15.5	15.5	16	90	1500	7.4	-1	2.3	0	0	22	3
2	5.18	14.6	14.6	16	90	1500	7.4	1	2.3	0	0	6	0
2	5.52	7.6	7.6	16	270	1500	7.2	-1	2.3	0	0	6	0
2	5.52	0.1	0.1	16	90	1500	7.2	0	2.3	0	0	22	4
2	5.52	7.8	7.8	16	270	1500	7.2	0	2.3	0	0	31	2

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
1	0	8	3.3	32	24.3	1500	4.9	0	1.6	0	1	22	3
1	0	11.6	7	32	37.1	1500	4.9	0	1.6	0	1	35	3
1	0	11.3	3	32	15.4	1500	4.9	0	1.6	0	1	34	3
1	0.1	11.1	3.9	32	20.7	1500	4.9	0	1.6	0	1	32	4
1	0.2	5.5	3.5	32	40.4	1500	4.9	0	1.6	0	1	35	2
1	0.3	14.5	3	32	12	1500	4.9	0	1.6	0	1	28	3
1	0.4	11.5	11.3	32	77.9	1500	4.9	-1	1.6	0	1	30	3
1	0.4	11.7	9.9	32	57.8	1500	5.1	-1	1.6	0	1	6	0
1	0.5	16.6	9.6	32	35.5	1500	5.1	0	1.6	0	1	26	3
1	0.7	19.3	2.3	32	6.9	1500	5.1	0	1.6	0	1	30	3
1	0.9	10.8	1.9	32	10	1500	5.1	0	1.6	0	1	24	3
1	0.9	17.9	17.9	32	90.4	1500	5.1	-1	1.6	0	1	21	3
1	0.9	10.9	6.4	32	36	1500	4.3	0	1.6	0	1	32	4
1	1	9.7	3.6	32	22	1500	4.3	0	1.6	0	1	34	3
1	1.1	12.5	1.2	32	5.4	1500	4.3	0	1.6	0	1	35	3
2	0	16	16	32	270	1500	4.9	1	1.6	0	1	30	3
2	0.1	9.5	9.5	32	90	1500	4.9	-1	1.6	0	1	6	0
2	0.1	19.8	19.8	32	90	1500	4.9	1	1.6	0	0	20	3
2	0.1	9.4	9.4	32	90	1500	4.9	-1	1.6	0	1	24	3
2	0.1	5.2	5.2	32	90	1500	4.9	-1	1.6	0	1	23	3
2	0.2	3.4	3.4	32	90	1500	4.9	-1	1.6	0	1	10	0
2	0.3	3.7	3.7	32	90	1500	4.9	-1	1.6	0	1	10	0
2	0.3	3.2	3.2	32	90	1500	4.9	-1	1.6	0	1	10	0
2	0.3	14.1	14.1	32	270	1500	4.9	1	1.6	0	1	24	3
2	0.3	10.1	10.1	32	90	1500	4.9	-1	1.6	0	1	10	0
2	0.3	3.2	3.2	32	90	1500	4.9	-1	1.6	0	1	10	0
2	0.3	8.5	8.5	32	90	1500	4.9	-1	1.6	0	1	35	2
2	0.4	17.7	17.7	32	270	1500	4.9	-1	1.6	0	1	6	0
2	0.4	14	14	32	270	1500	4.9	1	1.6	0	1	30	3
2	0.4	9.9	9.9	32	90	1500	4.9	-1	1.6	0	1	22	3
2	0.4	3.1	3.1	32	90	1500	5.1	-1	1.6	0	1	6	0
2	0.4	9.2	9.2	32	90	1500	5.1	-1	1.6	0	1	6	0
2	0.5	9.3	9.3	32	90	1500	5.1	-1	1.6	0	1	6	0
2	0.5	3.2	3.2	32	90	1500	5.1	-1	1.6	0	1	6	0
2	0.5	9	9	32	90	1500	5.1	-1	1.6	0	1	6	0
2	0.7	19.8	19.8	32	270	1500	5.1	-1	1.6	0	1	26	3
2	0.7	18.7	18.7	32	270	1500	5.1	-1	1.6	0	1	6	0
2	0.7	12.7	12.7	32	270	1500	5.1	-1	1.6	0	1	6	0
2	0.7	18.9	18.9	32	270	1500	5.1	-1	1.6	0	1	6	0
2	0.8	21.3	21.3	32	270	1500	5.1	-1	1.6	0	1	30	3
2	0.8	18.5	18.5	32	270	1500	5.1	-1	1.6	0	1	6	0
2	0.8	12.4	12.4	32	270	1500	5.1	-1	1.6	0	1	6	0
2	0.8	8.5	8.5	32	90	1500	5.1	-1	1.6	0	1	6	0
2	0.8	18.6	18.6	32	270	1500	5.1	-1	1.6	0	1	22	3
2	0.8	12.6	12.6	32	270	1500	5.1	-1	1.6	0	1	28	3
2	0.9	12.3	12.3	32	270	1500	5.1	-1	1.6	0	1	10	0
2	0.9	19.1	19.1	32	270	1500	4.3	-1	1.6	0	1	10	0
2	0.9	12.2	12.2	32	270	1500	4.3	-1	1.6	0	1	10	0
2	0.9	12.5	12.5	32	270	1500	4.3	-1	1.6	0	1	10	0
2	1	12.2	12.2	32	270	1500	4.3	-1	1.6	0	1	10	0
2	1	12.3	12.3	32	270	1500	4.3	-1	1.6	0	1	35	2

October 06, 1992 Search 1

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
2	1.1	14	14	32	270	1500	4.3	-1	1.6	0	1	23	3
2	1.1	17.7	17.7	32	270	1500	4.3	-1	1.6	0	1	24	3
2	1.15	26.9	26.9	32	270	1500	4.3	1	1.6	0	0	20	3
2	1.1	7.8	7.8	32	90	1500	4.3	1	1.6	0	1	30	3
2	1.1	17.9	17.9	32	270	1500	4.3	-1	1.6	0	1	6	0
2	1.2	4.4	4.4	32	270	1500	4.3	-1	1.6	0	1	22	3

October 06, 1992 Search 2

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
1	1.44	18.7	18.4	32	279.7	1500	4.3	0	1.6	0	1	30	3
1	1.44	31.2	2.3	32	141	1500	4.3	1	1.6	0	0	20	3
1	1.56	10	0.3	32	1.8	1500	1.7	0	1.6	0	1	24	3
1	1.56	8.9	8	32	116.9	1500	1.7	0	1.6	0	1	32	4
1	1.65	5.9	0.5	32	5.2	1500	1.7	0	1.6	0	1	30	3
1	1.67	13.8	13.8	32	88.8	1500	1.7	-1	1.6	0	1	28	3
1	2.15	9.3	8.4	32	64.6	1500	1	0	1.3	0	1	22	3
1	2.18	3.9	3.6	32	292.7	1500	1	1	1.3	0	0	30	3
1	2.23	8.1	8	32	84.1	1500	1	-1	1.3	0	1	10	0
1	2.26	10.8	3.8	32	20.5	1500	1	0	1.3	0	1	32	4
1	2.42	7.7	7.7	32	95.4	1500	1	1	1.3	0	1	34	3
2	1.44	17.7	17.7	32	90	1500	4.3	-1	1.6	0	1	6	0
2	1.44	3.2	3.2	32	90	1500	4.3	0	1.6	0	1	34	3
2	1.44	1.1	1.1	32	270	1500	4.3	0	1.6	0	1	35	3
2	1.45	13.4	13.4	32	90	1500	4.3	-1	1.6	0	1	23	3
2	1.5	12	12	32	90	1500	4.3	-1	[illegible]	0	1	35	3
2	1.53	11.5	11.5	32	90	1500	4.3	-1	[illegible]	0	1	10	0
2	1.58	13.7	13.7	32	90	1500	4.3	-1	[illegible]	0	1	10	0
2	1.61	13.3	13.3	32	90	1500	4.3	-1	1.6	0	1	10	0
2	1.61	20.2	20.2	32	90	1500	4.3	-1	1.6	0	1	10	0
2	1.64	13.4	13.4	32	90	1500	4.3	-1	1.6	0	1	10	0
2	1.65	20.1	20.1	32	90	1500	4.3	-1	1.6	0	1	35	2
2	1.68	7.5	7.5	32	270	1500	4.3	-1	1.6	0	1	6	0
2	1.68	19.9	19.9	32	90	1500	4.3	-1	1.6	0	1	22	3
2	1.72	13.3	13.3	32	90	1500	4.3	-1	1.6	0	1	6	0
2	1.72	19.4	19.4	32	90	1500	4.3	-1	1.6	0	1	6	0
2	1.72	21.7	21.7	32	90	1500	4.3	-1	1.6	0	1	30	3
2	1.79	19.6	19.6	32	90	1500	4.3	-1	1.6	0	1	6	0
2	1.79	13.4	13.4	32	90	1500	4.3	-1	1.6	0	1	6	0
2	1.83	19.3	19.3	32	90	1500	4.3	-1	1.6	0	1	6	0
2	1.87	21	21	32	90	1500	4.3	-1	1.6	0	1	26	3
2	1.99	10.7	10.7	32	270	1500	1	-1	1.6	0	1	26	3
2	2.03	8.8	8.8	32	270	1500	1	-1	1.3	0	1	6	0
2	2.06	2.9	2.9	32	270	1500	1	-1	1.3	0	1	6	0
2	2.06	9	9	32	270	1500	1	-1	1.3	0	1	6	0
2	2.12	10.6	10.6	32	270	1500	1	-1	1.3	0	1	30	3
2	2.13	8.6	8.6	32	270	1500	1	-1	1.3	0	1	6	0
2	2.13	2.4	2.4	32	270	1500	1	-1	1.3	0	1	6	0
2	2.16	18.5	18.5	32	90	1500	1	-1	1.3	0	1	6	0
2	2.17	10.4	10.4	32	90	1500	1	1	1.3	0	1	30	3
2	2.2	2.2	2.2	32	270	1500	1	-1	1.3	0	1	10	0
2	2.2	10.4	10.4	32	270	1500	1	-1	1.3	0	1	35	2
2	2.24	10.7	10.7	32	90	1500	1	1	1.3	0	1	24	3
2	2.24	2	2	32	270	1500	1	-1	1.3	0	1	10	0
2	2.27	2.3	2.3	32	270	1500	1	-1	1.3	0	1	10	0
2	2.31	1.9	1.9	32	270	1500	1	-1	1.3	0	1	10	0
2	2.34	2	2	32	270	1500	1	-1	1.3	0	1	35	2
2	2.39	3.4	3.4	32	270	1500	1	-1	1.3	0	1	23	3
2	2.42	7.1	7.1	32	270	1500	1	-1	1.3	0	1	24	3
2	2.44	14.7	14.7	32	270	1500	1	1	1.3	0	0	20	3
2	2.45	11.6	11.6	32	90	1500	1	1	1.3	0	1	35	3

October 06, 1992 Search 2

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
2	2.45	18	18	32	90	1500	1	1	1.3	0	1	30	3
2	2.45	7.3	7.3	32	270	1500	1	-1	1.3	0	1	6	0
2	2.49	6.2	6.2	32	90	1500	1	1	1.3	0	1	22	3

October 06, 1992 Search 3

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
1	2.62	15.5	15.5	16	272.9	1500	1	-1	1.3	0	0	22	3
1	2.63	9.1	2.2	16	345.9	1500	1	0	1.3	0	0	6	0
1	2.68	13.6	6.4	16	332	1500	1	-1	1.3	0	0	23	3
1	2.72	15	7.9	16	328.3	1500	1	-1	1.3	0	0	35	2
1	2.78	15	13.1	16	299.1	1500	1	-1	1.3	0	0	32	4
1	2.89	13	6.8	16	328.8	1500	1	-1	1.3	0	0	30	3
1	2.89	8.5	8.3	16	260.4	1500	1	-1	1.3	0	0	10	0
1	2.9	13.5	1.6	16	353.2	1500	1	0	1.3	0	0	22	3
1	2.93	15.2	0.2	16	359.1	1500	1.2	0	1.3	0	0	30	3
1	3	2.5	2.1	16	302.5	1500	1.2	-1	1.3	0	0	6	0
1	3.01	8.6	8.4	16	259.5	1500	1.2	-1	1.3	0	0	6	0
1	3.02	10.1	1.8	16	350	1500	1.2	0	1.3	0	0	6	0
1	3.07	14.3	1.3	16	354.7	1500	1.2	0	1.3	0	0	26	3
1	3.21	6	3.9	16	319.3	1500	1.2	1	1.3	0	0	26	3
1	3.24	7.5	3.4	16	333.3	1500	1.2	0	1.3	0	0	6	0
1	3.27	6.4	2.6	16	23.5	1500	1.2	0	1.3	0	0	6	0
1	3.34	7.1	2.9	16	24.2	1500	1.2	0	1.3	0	0	6	0
1	3.37	9.9	2.5	16	14.8	1500	1.2	0	1.3	0	0	30	3
1	3.41	8.2	2.6	16	341.8	1500	1.2	0	1.3	0	0	35	2
1	3.45	6.9	6.3	16	113.5	1500	1.7	0	1.3	0	0	10	0
1	3.45	7.7	3.5	16	27.1	1500	1.7	0	1.3	0	0	10	0
1	3.45	6.5	3.7	16	325.8	1500	1.7	1	1.3	0	0	10	0
1	3.49	15.6	8.7	16	33.6	1500	1.7	0	1.3	0	0	32	4
1	3.5	4.4	2.9	16	41.3	1500	1.7	-1	1.3	0	0	10	0
1	3.53	12.9	3.3	16	15.1	1500	1.7	-1	1.3	0	0	35	2
1	3.53	5.5	3.4	16	37.9	1500	1.7	-1	1.3	0	0	10	0
1	3.62	3.5	2.6	16	46.7	1500	1.7	-1	1.3	0	0	23	3
1	3.66	8.6	2	16	346.3	1500	1.7	-1	1.3	0	0	6	0
1	3.72	10.3	6.4	16	38.3	1500	1.7	-1	1.3	0	0	22	3
1	3.83	4.7	3	16	320.1	1500	1.7	1	1.3	0	0	22	3
1	3.85	12.4	8.7	16	315.5	1500	1.7	1	1.3	0	0	35	3
1	3.87	12.3	4.9	16	336.5	1500	1.7	1	1.3	0	0	34	3
1	3.91	11.4	5.6	16	29.5	1500	1.7	1	1.3	0	0	23	3
1	3.94	13.4	4	16	17.3	1500	3.5	1	1.3	0	0	35	2
1	3.98	10.7	1.6	16	351.3	1500	3.5	1	1.3	0	0	32	4
1	4.05	6.6	3.9	16	36.1	1500	3.5	1	1	0	0	10	0
1	4.11	8.7	3.3	16	22.4	1500	3.5	1	1	0	0	10	0
1	4.17	9.8	9.2	16	288.4	1500	3.5	0	1	0	0	30	3
1	4.31	11.6	3.5	16	17.8	1500	3.5	-1	1	0	0	30	3
1	4.4	9.8	3.5	16	20.7	1500	3.5	-1	1	0	0	24	3
1	4.45	12.8	4.4	16	339.7	1500	3.5	-1	1	0	0	32	4
1	4.5	13	9.8	16	311	1500	3.5	-1	1	0	0	35	2
1	4.57	13.3	12.2	16	283.9	1500	3.5	0	1	0	0	23	3
1	4.61	2.2	1.4	16	318.6	1500	3.5	-1	1	0	0	34	3
1	4.68	3.7	2.1	16	324.9	1500	3.5	-1	1	0	0	22	3
1	4.78	8.9	7.3	16	54.9	1500	3.5	1	1	0	0	22	3
1	4.79	14	1.7	16	7	1500	3.5	1	1	0	0	35	3
1	4.83	12.9	5.7	16	26.5	1500	3.5	1	1	0	0	34	3
1	4.94	14.6	14	16	73.6	1500	4.3	0	1	0	0	35	2
1	4.95	13.5	8.3	16	38	1500	4.3	1	1	0	0	32	4
1	5.02	9.8	0.3	16	1.6	1500	4.3	1	1	0	0	24	3

October 06, 1992 Search 3

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
1	5.1	9	0.1	16	0.6	1500	4.3	1	1	0	0	30	3
1	5.22	9.2	4.1	16	333.6	1500	4.3	-1	1	0	0	30	3
1	5.27	3.7	3.3	16	130	1500	4.3	0	1	0	0	6	0
1	5.29	10.4	4.8	16	332.2	1500	4.3	-1	1	0	0	24	3
1	5.39	12.8	12.2	16	286.3	1500	4.3	0	1	0	0	32	4
1	5.45	14.9	9.3	16	321.4	1500	5.2	-1	1	0	0	34	3
1	5.47	14.6	4.9	16	340.3	1500	5.2	-1	1	0	0	35	3
2	2.68	4.9	4.9	16	90	1500	1	-1	1.3	0	0	20	3
2	2.71	2.5	2.5	16	270	1500	1	-1	1.3	0	0	24	3
2	2.82	8.1	8.1	16	270	1500	1	-1	1.3	0	0	10	0
2	2.84	7.9	7.9	16	270	1500	1	-1	1.3	0	0	10	0
2	2.89	1.4	1.4	16	270	1500	1	-1	1.3	0	0	10	0
2	2.93	8.2	8.2	16	270	1500	1.2	-1	1.3	0	0	10	0
2	2.93	1.4	1.4	16	270	1500	1.2	-1	1.3	0	0	35	2
2	3.07	8	8	16	270	1500	1.2	-1	1.3	0	0	6	0
2	3.11	2.1	2.1	16	270	1500	1.2	-1	1.3	0	0	6	0
2	3.3	3.6	3.6	16	270	1500	1.2	0	1.3	0	0	6	0
2	3.37	4.8	4.8	16	270	1500	1.2	0	1.3	0	0	30	3
2	3.37	3.2	3.2	16	270	1500	1.2	0	1.3	0	0	6	0
2	3.41	15.8	15.8	16	90	1500	1.2	0	1.3	0	0	30	3
2	3.41	3.5	3.5	16	270	1500	1.2	0	1.3	0	0	22	3
2	3.66	13.1	13.1	16	90	1500	1.7	0	1.3	0	0	34	3
2	3.66	1.6	1.6	16	270	1500	1.7	-1	1.3	0	0	24	3
2	3.68	7.6	7.6	16	270	1500	1.7	-1	1.3	0	0	20	3
2	3.72	10.8	10.8	16	270	1500	1.7	1	1.3	0	0	20	3
2	3.89	15.6	15.6	16	270	1500	1.7	0	1.3	0	0	30	3
2	3.89	10.2	10.2	16	90	1500	1.7	0	1.3	0	0	6	0
2	3.9	15.5	15.5	16	90	1500	1.7	0	1.3	0	0	20	3
2	3.93	9.6	9.6	16	90	1500	3.5	0	1.3	0	0	24	3
2	4.04	3.7	3.7	16	90	1500	3.5	0	1	0	0	10	0
2	4.11	3.4	3.4	16	90	1500	3.5	0	1	0	0	10	0
2	4.11	9.3	9.3	16	270	1500	3.5	0	1	0	0	24	3
2	4.11	10.3	10.3	16	90	1500	3.5	0	1	0	0	10	0
2	4.15	10.1	10.1	16	90	1500	3.5	0	1	0	0	35	2
2	4.18	4.3	4.3	16	90	1500	3.5	0	1	0	0	30	3
2	4.18	9.8	9.8	16	90	1500	3.5	0	1	0	0	22	3
2	4.22	3.3	3.3	16	90	1500	3.5	0	1	0	0	6	0
2	4.22	11.4	11.4	16	90	1500	3.5	0	1	0	0	30	3
2	4.22	9.4	9.4	16	90	1500	3.5	0	1	0	0	6	0
2	4.26	3.5	3.5	16	90	1500	3.5	0	1	0	0	6	0
2	4.26	9.7	9.7	16	90	1500	3.5	0	1	0	0	6	0
2	4.29	8.7	8.7	16	270	1500	3.5	0	1	0	0	6	0
2	4.33	15.1	15.1	16	270	1500	3.5	0	1	0	0	6	0
2	4.33	9	9	16	270	1500	3.5	0	1	0	0	6	0
2	4.37	15.5	15.5	16	270	1500	3.5	0	1	0	0	22	3
2	4.37	11.8	11.8	16	90	1500	3.5	0	1	0	0	6	0
2	4.38	10.6	10.6	16	270	1500	3.5	0	1	0	0	30	3
2	4.4	15.9	15.9	16	270	1500	3.5	0	1	0	0	35	2
2	4.4	9.2	9.2	16	270	1500	3.5	0	1	0	0	10	0
2	4.44	9.3	9.3	16	270	1500	3.5	0	1	0	0	10	0
2	4.47	9.8	9.8	16	270	1500	3.5	0	1	0	0	10	0

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DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
2	4.51	9.6	9.6	16	270	1500	3.5	0	1	0	0	10	0
2	4.62	15.2	15.2	16	270	1500	3.5	0	1	0	0	24	3
2	4.65	3.2	3.2	16	90	1500	3.5	0	1	0	0	35	3
2	4.65	10.3	10.3	16	90	1500	3.5	0	1	0	0	30	3
2	4.66	15.6	15.6	16	270	1500	3.5	0	1	0	0	6	0
2	4.85	5.5	5.5	16	270	1500	3.5	0	1	0	0	30	3
2	5	13.6	13.6	16	90	1500	4.3	0	1	0	0	10	0
2	5.03	13.7	13.7	16	90	1500	4.3	0	1	0	0	10	0
2	5.08	13	13	16	90	1500	4.3	0	1	0	0	10	0
2	5.11	12.9	12.9	16	90	1500	4.3	0	1	0	0	10	0
2	5.14	8.2	8.2	16	270	1500	4.3	0	1	0	0	6	0
2	5.18	12.4	12.4	16	90	1500	4.3	0	1	0	0	6	0
2	5.5	2.3	2.3	16	90	1500	5.2	-1	1	0	0	30	3

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
1	0.09	12	5.1	16	25.1	1500	9.9	-1	1.6	0	1	28	3
1	0.09	8.6	1	16	353.4	1500	9.9	-1	1.6	0	1	34	3
1	0.11	13.7	0.3	16	1.2	1500	9.9	0	1.6	0	1	35	2
1	0.13	16.5	3.9	16	346.4	1500	9.9	-1	1.6	0	1	35	2
1	0.17	6.3	0.9	16	8.1	1500	9.9	0	1.6	0	1	32	4
1	0.18	8.7	0.8	16	5.1	1500	9.9	0	1.6	0	1	10	0
1	0.21	6.5	6.1	16	289.1	1500	9.9	-1	1.6	0	1	10	0
1	0.22	12.5	0.9	16	356	1500	9.9	-1	1.6	0	1	28	3
1	0.26	6.2	5.1	16	304.1	1500	9.9	-1	1.6	0	1	10	0
1	0.33	11.5	0.5	16	357.5	1500	9.9	0	1.6	0	1	30	3
1	0.85	12.3	4.5	16	338.7	1500	9.5	1	1.6	0	1	28	3
1	0.9	14.3	1.2	16	355.3	1500	9.1	1	1.6	0	1	35	2
1	0.93	12.1	6.1	16	330	1500	9.1	1	1.6	0	1	32	4
1	0.94	13.2	5.5	16	335.1	1500	9.1	1	1.6	0	1	35	2
1	0.96	2.7	0.8	16	18.3	1500	9.1	0	1.6	0	1	10	0
1	1	11.7	4	16	339.9	1500	9.1	1	1.6	0	1	34	3
1	1.01	7.7	0.1	16	0.8	1500	9.1	0	1.6	0	1	28	3
1	1.24	5.3	1.2	16	346.5	1500	9.1	-1	1.6	0	1	22	3
1	1.31	14.5	5	16	20.3	1500	9.1	0	1.6	0	1	28	3
1	1.31	14.4	9	16	38.8	1500	9.1	0	1.6	0	1	34	3
1	1.4	13.2	10.4	16	52.1	1500	9.1	0	1.6	0	1	32	4
1	1.4	11.3	5.9	16	31.6	1500	9.1	0	1.6	0	1	35	2
1	1.42	10.2	10.1	16	84.9	1500	9.1	1	1.6	0	1	35	2
1	1.43	15.7	15.3	16	282.9	1500	9.1	-1	1.6	0	1	30	4
1	1.46	15.1	8.9	16	36.3	1500	9.1	0	1.6	0	1	28	3
2	0	14	14	16	270	1500	9.9	-1	1.6	0	1	22	3
2	0.03	0.8	0.8	16	270	1500	9.9	-1	1.6	0	1	24	3
2	0.03	0.8	0.8	16	270	1500	9.9	-1	1.6	0	1	26	3
2	0.06	2.2	2.2	16	90	1500	9.9	1	1.6	0	1	20	3
2	0.06	0.9	0.9	16	90	1500	9.9	1	1.6	0	1	22	3
2	0.14	2.9	2.9	16	90	1500	9.9	1	1.6	0	1	23	3
2	0.21	4	4	16	270	1500	9.9	1	1.6	0	1	6	0
2	0.32	2.7	2.7	16	90	1500	9.9	1	1.6	0	1	10	0
2	0.39	0.7	0.7	16	270	1500	9.5	1	1.6	0	1	6	0
2	0.43	0.1	0.1	16	270	1500	9.5	1	1.6	0	1	6	0
2	0.49	1.3	1.3	16	90	1500	9.5	1	1.6	0	1	6	0
2	0.69	6.8	6.8	16	270	1500	9.5	1	1.6	0	1	6	0
2	0.75	5.4	5.4	16	270	1500	9.5	1	1.6	0	1	6	0
2	0.79	4.7	4.7	16	270	1500	9.5	1	1.6	0	1	6	0
2	0.79	7.5	7.5	16	270	1500	9.5	1	1.6	0	1	30	3
2	0.86	8.1	8.1	16	270	1500	9.5	1	1.6	0	1	10	0
2	0.9	0.2	0.2	16	270	1500	9.1	1	1.6	0	1	10	0
2	0.95	6.4	6.4	16	270	1500	9.1	1	1.6	0	1	10	0
2	0.97	5.9	5.9	16	270	1500	9.1	1	1.6	0	1	10	0
2	0.97	1.2	1.2	16	270	1500	9.1	1	1.6	0	1	6	0
2	1.05	6.1	6.1	16	270	1500	9.1	1	1.6	0	1	23	3
2	1.13	9.1	9.1	16	270	1500	9.1	1	1.6	0	1	20	3
2	1.13	9.5	9.5	16	270	1500	9.1	1	1.6	0	1	22	3
2	1.15	3	3	16	270	1500	9.1	1	1.6	0	1	24	3
2	1.15	3	3	16	270	1500	9.1	1	1.6	0	1	26	3
2	1.16	6.6	6.6	16	90	1500	9.1	-1	1.6	0	1	22	3

October 08, 1992 Search 1

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
2	1.27	8.1	8.1	16	90	1500	9.1	1	1.6	0	1	24	3
2	1.27	8.1	8.1	16	90	1500	9.1	1	1.6	0	1	26	3
2	1.3	14.7	14.7	16	90	1500	9.1	1	1.6	0	1	20	3
2	1.3	14.9	14.9	16	90	1500	9.1	1	1.6	0	1	22	3
2	1.38	10.5	10.5	16	90	1500	9.1	1	1.6	0	1	23	3
2	1.45	5.9	5.9	16	90	1500	9.1	1	1.6	0	1	6	0
2	1.46	3.8	3.8	16	90	1500	9.1	1	1.6	0	1	10	0
2	1.46	10.6	10.6	16	90	1500	9.1	1	1.6	0	1	10	0
2	1.48	11	11	16	90	1500	9.1	1	1.6	0	1	10	0
2	1.49	14.7	14.7	16	270	1500	9.1	-1	1.6	0	1	30	3
2	1.52	4.7	4.7	16	90	1500	9.1	1	1.6	0	1	10	0
2	1.52	14.3	14.3	16	270	1500	9.1	1	1.6	0	1	6	0
2	1.56	12.5	12.5	16	90	1500	9.1	1	1.6	0	1	10	0
2	1.62	14.7	14.7	16	90	1500	9.1	1	1.6	0	1	30	3
2	1.63	9	9	16	90	1500	9.1	1	1.6	0	1	6	0
2	1.67	9.6	9.6	16	90	1500	9.1	1	1.6	0	1	6	0
2	1.71	14.9	14.9	16	270	1500	9.1	1	1.6	0	1	6	0
2	1.74	14.6	14.6	16	270	1500	9.1	1	1.6	0	1	6	0
2	1.82	12.4	12.4	16	90	1500	9.1	-1	1.6	0	1	24	3
2	1.84	8.7	8.7	16	90	1500	9.1	1	1.6	0	1	6	0
2	1.84	10.4	10.4	16	270	1500	9.1	1	1.6	0	1	10	0
2	1.84	14.6	14.6	16	270	1500	9.1	1	1.6	0	1	28	3
2	1.84	8.3	8.3	16	90	1500	9.1	0	1.6	0	1	30	3

October 08, 1992 Search 2

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
1	1.87	9.6	8.2	32	58.8	1500	9.1	-1	1.6	0	1	30	3
1	1.87	14.8	14.6	32	259.9	1500	9.1	1	1.6	0	1	28	3
1	1.88	14.2	11.4	32	306.6	1500	9.1	1	1.6	0	1	6	0
1	1.9	11.7	10.1	32	300.8	1500	7.6	0	1.6	0	1	35	2
1	1.98	15.5	14.3	32	292.1	1500	7.6	1	1.6	0	1	34	3
1	2.06	11.1	3.3	32	342.5	1500	7.6	1	1.6	0	1	22	3
1	2.09	12.9	12.5	32	282.9	1500	7.6	1	1.6	0	1	24	3
1	2.13	9.4	8.3	32	62	1500	7.6	-1	1.6	0	1	35	3
1	2.16	6.5	0.2	32	358.1	1500	7.6	-1	1.6	0	1	35	3
1	2.34	14.5	5.7	32	23.1	1500	7.6	-1	1.6	0	1	35	2
1	2.38	14.4	3.9	32	344.1	1500	7.6	-1	1.6	0	1	30	3
1	2.48	4.4	4.4	32	269.5	1500	7.8	-1	1.6	0	1	6	0
1	2.49	10	8.1	32	305.7	1500	7.8	-1	1.6	0	1	24	3
1	2.75	11.1	5.9	32	212.1	1500	7.8	0	1.6	0	1	24	3
1	2.75	14.7	2.5	32	350.1	1500	7.8	1	1.6	0	1	30	3
1	2.81	7.7	1	32	7.3	1500	7.8	0	1.6	0	1	30	4
2	1.84	14.7	14.7	32	270	1500	9.1	1	1.6	0	1	6	0
2	1.84	15.4	15.4	32	270	1500	9.1	1	1.6	0	1	6	0
2	1.84	18.2	18.2	32	270	1500	9.1	1	1.6	0	1	10	0
2	1.84	21.4	21.4	32	270	1500	9.1	0	1.6	0	1	30	3
2	1.84	9.2	9.2	32	270	1500	9.1	1	1.6	0	1	22	3
2	1.84	12.4	12.4	32	90	1500	9.1	-1	1.6	0	1	24	3
2	1.85	8.7	8.7	32	90	1500	9.1	1	1.6	0	1	6	0
2	1.86	10.3	10.3	32	270	1500	9.1	1	1.6	0	1	10	0
2	1.9	16.6	16.6	32	270	1500	7.6	1	1.6	0	1	10	0
2	1.92	16.2	16.2	32	270	1500	7.6	1	1.6	0	1	10	0
2	1.92	9.4	9.4	32	270	1500	7.6	1	1.6	0	1	10	0
2	1.93	10	10	32	90	1500	7.6	-1	1.6	0	1	30	4
2	1.93	16.5	16.5	32	270	1500	7.6	1	1.6	0	1	32	4
2	1.96	15.7	15.7	32	270	1500	7.6	1	1.6	0	1	35	2
2	1.99	10.4	10.4	32	270	1500	7.6	1	1.6	0	1	28	3
2	2	16	16	32	270	1500	7.6	1	1.6	0	1	23	3
2	2.08	20.6	20.6	32	270	1500	7.6	1	1.6	0	1	20	3
2	2.22	8.9	8.9	32	90	1500	7.6	1	1.6	0	1	22	3
2	2.23	17.8	17.8	32	90	1500	7.6	1	1.6	0	1	24	3
2	2.25	25.9	25.9	32	90	1500	7.6	1	1.6	0	1	20	3
2	2.33	21	21	32	90	1500	7.6	1	1.6	0	1	23	3
2	2.33	19.3	19.3	32	90	1500	7.6	1	1.6	0	1	34	3
2	2.34	15.3	15.3	32	90	1500	7.6	1	1.6	0	1	28	3
2	2.38	20.4	20.4	32	90	1500	7.6	1	1.6	0	1	35	2
2	2.4	21	21	32	90	1500	7.8	1	1.6	0	1	32	4
2	2.4	5.7	5.7	32	270	1500	7.8	-1	1.6	0	1	30	4
2	2.41	16.1	16.1	32	90	1500	7.8	1	1.6	0	1	6	0
2	2.41	14	14	32	90	1500	7.8	1	1.6	0	1	10	0
2	2.42	20.8	20.8	32	90	1500	7.8	1	1.6	0	1	10	0
2	2.44	21.2	21.2	32	90	1500	7.8	1	1.6	0	1	10	0
2	2.48	14.8	14.8	32	90	1500	7.8	1	1.6	0	1	10	0
2	2.48	19	19	32	90	1500	7.8	1	1.6	0	1	28	3
2	2.52	13.9	13.9	32	90	1500	7.8	1	1.6	0	1	22	3
2	2.52	22.5	22.5	32	90	1500	7.8	1	1.6	0	1	10	0
2	2.53	18.9	18.9	32	90	1500	7.8	1	1.6	0	1	6	0

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DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
2	2.53	19.5	19.5	32	90	1500	7.8	1	1.6	0	1	6	0
2	2.53	27.1	27.1	32	90	1500	7.8	1	1.6	0	1	30	3
2	2.75	24.4	24.4	32	270	1500	7.8	1	1.6	0	1	6	0
2	2.75	27.8	27.8	32	270	1500	7.8	1	1.6	0	1	10	0
2	2.75	18.7	18.7	32	270	1500	7.8	1	1.6	0	1	22	3
2	2.76	0.9	0.9	32	270	1500	7.8	1	1.6	0	1	6	0
2	2.77	24.2	24.2	32	270	1500	7.8	1	1.6	0	1	28	3
2	2.77	20	20	32	270	1500	7.8	1	1.6	0	1	10	0
2	2.81	26.2	26.2	32	270	1500	7.8	1	1.6	0	1	10	0
2	2.83	25.8	25.8	32	270	1500	7.8	1	1.6	0	1	10	0
2	2.83	19	19	32	270	1500	7.8	1	1.6	0	1	10	0
2	2.84	21.1	21.1	32	270	1500	7.8	1	1.6	0	1	6	0
2	2.84	1	1	32	90	1500	7.8	-1	1.6	0	1	30	4
2	2.85	26	26	32	270	1500	7.8	1	1.6	0	1	32	4
2	2.87	25.3	25.3	32	270	1500	7.8	1	1.6	0	1	35	2
2	2.91	20.1	20.1	32	270	1500	5.6	1	1.6	0	1	28	3
2	2.92	24.1	24.1	32	270	1500	5.6	1	1.6	0	1	34	3
2	2.92	26.2	26.2	32	270	1500	5.6	1	1.6	0	1	23	3
2	2.99	29.3	29.3	32	270	1500	5.6	1	1.6	0	1	20	3
2	3.02	21.7	21.7	32	270	1500	5.6	1	1.6	0	1	24	3
2	3.03	13	13	32	270	1500	5.6	1	1.6	0	1	22	3
2	3.06	5.9	5.9	32	90	1500	5.6	0	1.6	0	1	35	3

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DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
1	3.22	6	5.8	16	259.8	1500	5.6	-1	1.6	0	1	22	3
1	3.22	12.3	10.9	16	[illegible]	[illegible]	[illegible]	1	1.6	0	1	20	3
1	3.24	17.8	5.2	16	[illegible]	[illegible]	[illegible]	0	1.6	0	1	34	3
1	3.26	14.4	1.2	16	[illegible]	[illegible]	5.6	0	1.6	0	1	28	3
1	3.29	18	6.5	16	[illegible]	[illegible]	5.6	0	1.6	0	1	35	2
1	3.33	15	2.2	16	[illegible]	[illegible]	5.6	0	1.6	0	1	35	2
1	3.33	14.8	7	16	28.4	1500	5.6	0	1.6	0	1	32	4
1	3.41	14.5	5.4	16	22	1500	4.5	0	1.6	0	1	28	3
1	3.42	18.7	18.2	16	283	1500	4.5	-1	1.6	0	1	30	3
1	3.47	7.2	0.1	16	1	1500	4.5	0	1.6	0	0	22	3
1	3.69	6.9	6.8	16	100.5	1500	4.5	1	1.6	0	0	6	0
1	3.7	10.6	7.1	16	42	1500	4.5	0	1.6	0	0	26	3
1	4.04	18.1	9.5	16	31.9	1500	1.7	0	1.3	0	0	30	3
1	4.04	12.9	12.9	16	84.8	1500	1.7	-1	1.3	0	0	24	3
1	4.06	14.9	14	16	289.1	1500	1.7	1	1.3	0	0	28	3
1	4.1	15.1	10.7	16	314.9	1500	1.7	1	1.3	0	0	35	2
1	4.13	9.5	8.7	16	293.7	1500	1.7	1	1.3	0	0	10	0
1	4.13	16.8	15.7	16	290.8	1500	1.7	1	1.3	0	0	32	4
1	4.14	17.8	14.9	16	303.2	1500	1.7	1	1.3	0	0	35	2
1	4.14	11.6	11.2	16	75.1	1500	1.7	-1	1.3	0	0	30	4
1	4.2	16.4	14.5	16	297.8	1500	1.7	1	1.3	0	0	34	3
2	3.23	2.7	2.7	16	90	1500	5.6	1	1.6	0	0	24	3
2	3.32	7.5	7.5	16	90	1500	5.6	1	1.6	0	0	23	3
2	3.41	0.1	0.1	16	90	1500	4.5	1	1.6	0	0	10	0
2	3.41	2.2	2.2	16	90	1500	4.5	1	1.6	0	0	6	0
2	3.41	6.9	6.9	16	90	1500	4.5	1	1.6	0	0	10	0
2	3.43	7.3	7.3	16	90	1500	4.5	1	1.6	0	0	10	0
2	3.47	1	1	16	90	1500	4.5	1	1.6	0	0	10	0
2	3.51	8.8	8.8	16	90	1500	4.5	1	1.6	0	0	10	0
2	3.58	10.9	10.9	16	90	1500	4.5	1	1.6	0	0	30	3
2	3.59	5.2	5.2	16	90	1500	4.5	1	1.6	0	0	6	0
2	3.63	5.9	5.9	16	90	1500	4.5	1	1.6	0	0	6	0
2	3.69	7.1	7.1	16	90	1500	4.5	1	1.6	0	0	6	0
2	3.74	7.2	7.2	16	90	1500	4.5	0	1.6	0	0	26	3
2	3.93	15.3	15.3	16	270	1500	1.7	1	1.6	0	0	6	0
2	3.97	14.6	14.6	16	270	1500	1.7	1	1.3	0	0	6	0
2	4.05	9	9	16	270	1500	1.7	1	1.3	0	0	22	3
2	4.08	9.1	9.1	16	90	1500	1.7	1	1.3	0	0	6	0
2	4.09	9.9	9.9	16	270	1500	1.7	1	1.3	0	0	10	0
2	4.15	15.6	15.6	16	270	1500	1.7	1	1.3	0	0	10	0
2	4.16	10.9	10.9	16	270	1500	1.7	1	1.3	0	0	6	0
2	4.16	10.8	10.8	16	270	1500	1.7	1	1.3	0	0	35	2
2	4.23	9.7	9.7	16	270	1500	1.7	1	1.3	0	0	28	3
2	4.24	15.2	15.2	16	270	1500	1.7	1	1.3	0	0	23	3
2	4.34	10	10	16	270	1500	1.7	1	1.3	0	0	24	3
2	4.34	2.5	2.5	16	270	1500	1.7	1	1.3	0	0	22	3

DET	TOT	RNG	LATRNG	RNGSC	RBG	ALT	WDSP	SWDIR	HS	PRECIP	WCAPS	SIZE	TRGREF
1	4.44	21	18	32	58.7	1500	4.3	0	1.3	0	0	20	3
1	4.51	17.6	9	32	30.8	1500	4.3	0	1.3	0	0	28	3
1	4.53	15.8	12.8	32	54.1	1500	4.3	0	1.3	0	0	34	3
1	4.55	23.9	10	32	24.6	1500	4.3	0	1.3	0	0	35	2
1	4.6	16.5	12.2	32	312.2	1500	4.3	-1	1.3	0	0	30	4
1	4.61	14.8	14.1	32	72.2	1500	4.3	1	1.3	0	0	35	2
1	4.62	15.5	14.3	32	67.5	1500	4.3	1	1.3	0	0	32	4
1	4.65	7.7	7.4	32	75.7	1500	4.3	1	1.3	0	0	10	0
1	4.69	14.9	13.1	32	61.2	1500	4.3	1	1.3	0	0	28	3
1	4.73	10.8	7.7	32	45.3	1500	4.3	0	1.3	0	0	22	3
1	4.98	14.9	14.8	32	84.5	1500	2.1	1	1.3	0	0	26	3
1	5.02	10.8	1.9	32	344	1500	2.1	1	1.3	0	0	26	3
1	5.26	14.7	4.3	32	342.9	1500	2.1	1	1.3	0	0	28	3
1	5.32	16.5	0.9	32	3.1	1500	2.1	0	1.3	0	0	35	2
1	5.34	26.6	1.7	32	3.7	1500	2.1	0	1.3	0	0	28	3
1	5.36	14	3.6	32	345.1	1500	2.1	1	1.3	0	0	35	2
1	5.37	7.3	4	32	326.5	1500	2.1	1	1.3	0	0	10	0
1	5.41	15.3	2	32	352.5	1500	3.7	1	1.3	0	0	34	3
1	5.48	16.1	6.7	32	335.5	1500	3.7	1	1.3	0	0	20	3
2	4.47	2.2	2.2	32	90	1500	4.3	1	1.3	0	0	22	3
2	4.48	9.6	9.6	32	90	1500	4.3	1	1.3	0	0	24	3
2	4.58	14.6	14.6	32	90	1500	4.3	1	1.3	0	0	23	3
2	4.66	10.1	10.1	32	90	1500	4.3	1	1.3	0	0	6	0
2	4.67	14.8	14.8	32	90	1500	4.3	1	1.3	0	0	10	0
2	4.69	15.2	15.2	32	90	1500	4.3	1	1.3	0	0	10	0
2	4.7	10.5	10.5	32	270	1500	4.3	-1	1.3	0	0	30	3
2	4.73	9	9	32	90	1500	4.3	1	1.3	0	0	10	0
2	4.73	10.1	10.1	32	270	1500	4.3	1	1.3	0	0	6	0
2	4.77	13.7	13.7	32	270	1500	4.3	-1	1.3	0	0	24	3
2	4.77	16.8	16.8	32	90	1500	4.3	1	1.3	0	0	10	0
2	4.84	13.3	13.3	32	90	1500	4.3	1	1.3	0	0	6	0
2	4.88	14	14	32	90	1500	4.3	1	1.3	0	0	6	0
2	4.94	15.3	15.3	32	90	1500	2.1	1	1.3	0	0	6	0
2	5.12	5.3	5.3	32	270	1500	2.1	1	1.3	0	0	6	0
2	5.17	3.9	3.9	32	270	1500	2.1	1	1.3	0	0	6	0
2	5.22	3.2	3.2	32	270	1500	2.1	1	1.3	0	0	6	0
2	5.29	6.5	6.5	32	270	1500	2.1	1	1.3	0	0	10	0
2	5.29	24.1	24.1	32	90	1500	2.1	-1	1.3	0	0	24	3
2	5.3	2.4	2.4	32	90	1500	2.1	-1	1.3	0	0	22	3
2	5.33	20.5	20.5	32	90	1500	2.1	1	1.3	0	0	6	0
2	5.33	1.5	1.5	32	90	1500	2.1	1	1.3	0	0	10	0
2	5.36	20.9	20.9	32	90	1500	2.1	-1	1.3	0	0	30	3
2	5.38	4.6	4.6	32	270	1500	2.1	1	1.3	0	0	10	0
2	5.4	2.7	2.7	32	90	1500	3.7	1	1.3	0	0	10	0
2	5.4	23.2	23.2	32	90	1500	3.7	-1	1.3	0	0	30	4
2	5.4	0.6	0.6	32	90	1500	3.7	1	1.3	0	0	6	0
2	5.41	6.1	6.1	32	270	1500	3.7	1	1.3	0	0	32	4
2	5.48	3	3	32	270	1500	3.7	0	1.3	0	0	23	3
2	5.49	11.5	11.5	32	90	1500	3.7	0	1.3	0	0	22	3
2	5.49	4.5	4.5	32	270	1500	3.7	0	1.3	0	0	24	3

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APPENDIX B

BEST FIT CURVE CONSTANTS

The following table lists the values for the constants of the lateral range curves in figures 2-2 through 2-26.

Table B-1. Lateral Range Curve Coefficients

Figure	A	B	C	Sweep Width
2-2	11.607	2.171	20.169	8.8
2-3	6.611	0.00	20.54	3.8
2-4	1.349	6.248	7.096	2.7
2-5	5.258	4.57	11.639	7.0
2-6	8.767	2.829	15.235	8.6
2-7	14.069	0	87.695	3.4
2-8	12.790	1.085	28.983	6.8
2-9	52.881	3.446	68.242	17.7
2-10	15.082	4.286	37.303	8.4
2-11	208.5	0	250.030	20.9
2-12	38.260	2.686	44.014	17.2
2-13	24.322	5.286	41.071	15.4
2-14	N/A	N/A	N/A	N/A
2-15	70.829	4.989	90.437	25.6
2-16	28.897	1.155	27.581	17.8
2-17	59.522	9.903	136.506	14.4
2-18	80.200	0	124.105	13.9
2-19	7.563	8.24	21.614	7.3
2-20	24.833	3.149	33.533	14.1
2-21	91.464	9.022	118.919	24.8
2-22	298.792	3.650	317.880	27.1
2-23	75.781	8.253	153.563	16.5
2-24	50.872	3.768	75.756	15.9
2-25	95.67	16	382.68	15.4
2-26	26.871	1.915	32.425	16.1

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